The NATIONAL GEOGRAPHIC MAGAZINE

Vol. XX MAY, 1909 No. 5

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A Plague of Mice. With 7 Illustrations.

The National Geographic Society.

Greely's Handbook of Alaska.

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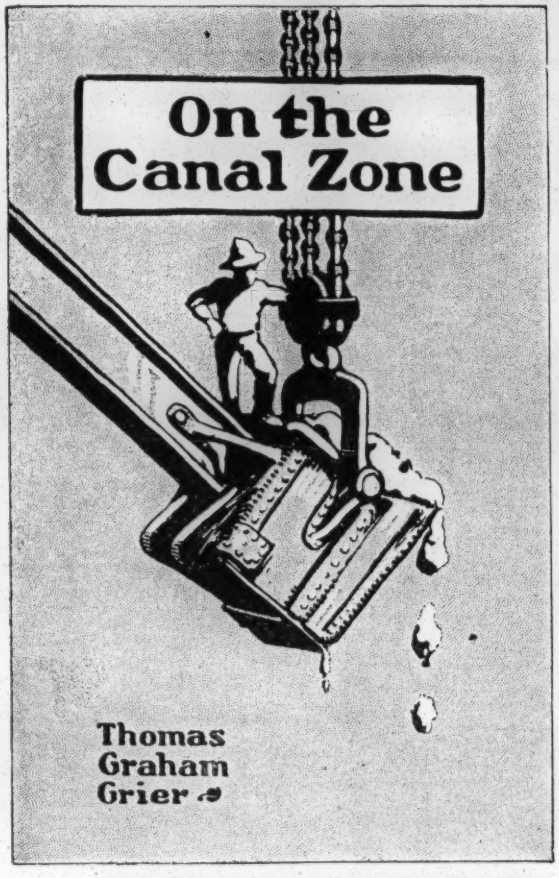

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VOL. XX, NO. 5 WASHINGTON MAY, 1909

THE NATIONAL GEOGRAPHIC MAGAZINE

THE CALL OF THE WEST*

Homes are being made for Millions of People in the Arid West

BY C. J. BLANCHARD

STATISTICIAN, U. S. RECLAMATION SERVICE

THE Call of the West comes to us today insistent and inviting. Formerly it was a Call of the Wild, a voice from out a vast wilderness of mountains, deserts, and plains.

The iron horse has conquered distance and the barriers long interposed by vast spaces of waterless desert have been thrown down. Irrigation canals long enough to girdle the globe with triple bands have spread wide oases of green in the arid places. Cheerful, prosperous communities dot a landscape once vacant and voiceless.

The Great Plains invite the scientific farmer to overcome the lack of rain by intelligent methods of cultivation and wisdom in seed selection.

The unsurveyed and unexplored mountains await the prospector to disclose mineral riches untold. Countless streams rushing downward from snowy summits, unchecked and uncontrolled, lure the engineer to harness and utilize for the needs of commerce the power now wasted. The desert — mysterious, silent, expectant, quivering under cloudless skies—holds a promise of freedom and independence to the careworn and discouraged. It offers the uplift of unmeasured distances and the individual home with that broader freedom of action which comes with life in the open.

May not the influence of its far-flung horizons and its true perspective be potential in character moulding and building? The cradle of our civilization was rocked in the desert. Plato and Socrates dreamed their dreams, imbibed their splendid imagery and stately rhetoric in a rainless land. May not our own desert develop new systems of ethics and morals to lead us back from the material to the spiritual, into ways of gentleness and simple living.

Untouched by plow, unleached by rain, the desert holds fast the accumulated fertility of ages. It awaits the quickening kiss of canal-borne water to yield abundant harvests and to provide homes for millions of our people.

No national work is of more importance today than that of reclaiming for home-builders an empire which in its

* An address to the National Geographic Society, April 2, 1909.

present state is uninhabited and worthless. To those who dwell on the Atlantic slope it seems a far cry to the Great American Desert in which this work is going forward. Our country is of such vast extent, and the desert is so little known, that the average Easterner gives but slight heed to this particular phase of our industrial development, dismissing the subject as of no personal moment. A more careful consideration of all the factors involved in national reclamation makes it apparent that in many essential particulars the creation of a new commonwealth in the arid West possesses features of interest to every manufacturing city in the East. The completion of each engineering work initiates agricultural development. Compact farming communities are quickly established in the zones of irrigation; villages, towns, and cities follow. Railroads extend their branches to the remotest limits of the new country, bringing the commerce of the world to new markets. In a financial way every large manufacturer in the East is interested in the development which is thus promoted. For many years to come the hundreds of thousands of settlers must look to the East for what they wear, for machinery of all kinds, for many of the necessaries and most of the luxuries they require.

HOMES FOR ONE MILLION FAMILIES

Viewed from other than the commercial aspect, the work of reclamation is of national interest, because it will tend in some measure to relieve the overcrowding and congestion of older settled portions of the country. A conservative estimate is that 30,000,000 acres of land will be reclaimed in the arid West. On this basis there will be homes on the land for more than a million families. Each family on the farm will support another family in the urban communities which will rise in these new agricultural districts.

Looking forward to 1950, when our population is likely to be 150,000,000, who can measure the importance of a work which will guarantee homes and employment for ten millions of people, and which will bring into cultivation such a vast food-producing area.

National reclamation gave a wonderful impetus to private enterprise, and astonishing success in the settlement of large areas has followed the efforts of a number of corporations working in conjunction with state governments. There is more activity on the part of individuals in irrigation work today than in any previous time in our history. The development and growth of our arid states and territories during the past five years have been amazing. Land values have steadily risen and the much-desired subdivision of large holdings is increasing with the rise in values. I believe the time will come, and at no distant day, when the big land-owner will be regarded as an undesirable citizen, and laws will be enacted or taxes so assessed as to make it unprofitable to maintain vast estates of which only small portions are productive, and which furnish no employment for the people. To my mind one of the most cheering features of the present growth of the West is this breaking up of the great estates, many of which were taken from the public domain by methods more or less questionable. Here and there are vast tracts of land held in single ownership, or by corporations, which interpose a barrier to the land-hungry and offer obstacles to the proper development of the country.

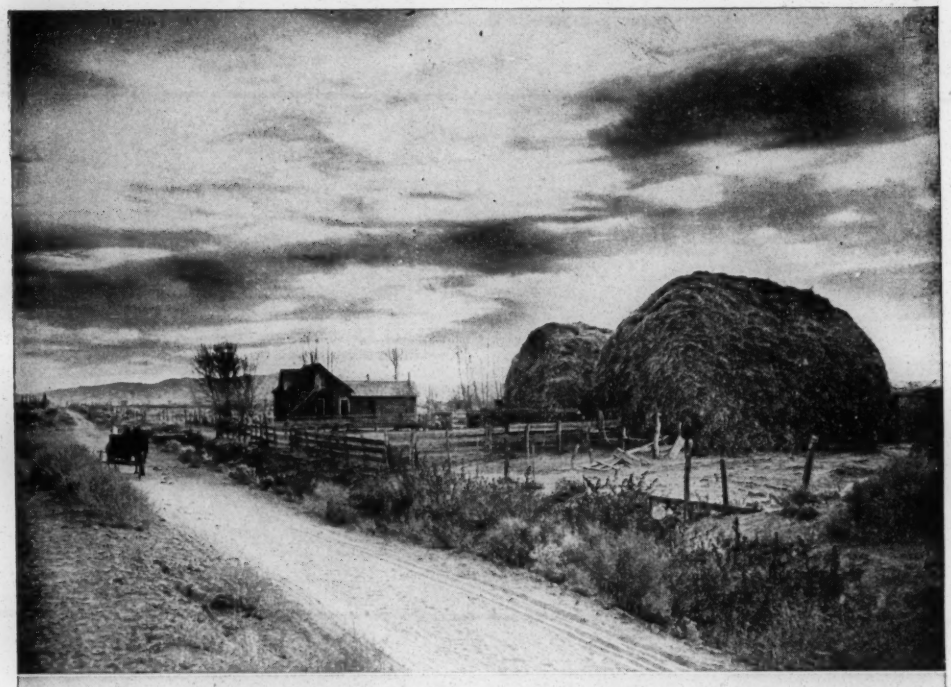
In the main, however, the tendency strongly is to subdivide. The great cattle ranches are being cut up in quarter-section farms, and four homes or more to the square mile dot a landscape which a short time ago held perhaps only a lone ranch house within the radius of vision. Ten years ago I drove for two days across a part of Montana and never saw a spot where the virgin sod had been turned. You cannot drive a mile in any direction in that section today without seeing cultivated land.

THE VERSATILITY OF THE WEST

Versatility is not confined to any one locality in the West. In the majesty and

BUILDING A HOMESTEAD OF CONCRETE BLOCKS ON THE TRUCKEE-CARSON IRRIGATION PROJECT, NEVADA (SEE PAGE 427)

TYPE OF THE CENTRALIZED GRADED SCHOOLS ON THE HUNTLEY PROJECT, MONTANA
Two years ago there was not an inhabitant within miles of this school-house (see page 408)



A TWO-YEAR-OLD HOMESTEAD ON THE TRUCKEE-CARSON PROJECT, NEVADA

200 COLONIES OF BEES ON THE SAME PROJECT (SEE PAGE 427)

grandeur of its mountains, lifting their heads into regions of perpetual snow; in forests whose age antedates the birth of the Savior; in canyons whose picturesque carving consumed centuries upon centuries of time; in landscapes and scenery of such beauty and color as were never shown on canvas; in deserts where life is still elemental and primitive, and where amid the crumbling ruins of departed races strange people dwell in an atmosphere of dreams and enchantment, and with mythology and legends as interesting as those of ancient Greece; in all that Nature has ever done to enthrall the senses, to inspire the tongue or pen, the West suffers not by comparison with any part of the Old World. We show but faint regard for all the wonders Nature has lavished on our country when so few of us ever seek to enjoy them. A few of the millions spent annually by Americans in foreign lands, if expended at home, would make easy of access and enjoyment for thousands of our people many of the splendid attractions of our own country.

The man from the West sojourning for a time in the East, if he gives free expression to the pride he rightly feels in his native heath, is likely to be regarded as an apostle of discontent by those who listen. Lucky for him if he does not achieve the reputation for veracity given to an old fellow in the middle West.

The oldest inhabitant and the man who remembered the weather for fifty years back were seated about the stove in the corner grocery one winter's night discussing the veracity of old Si Perkins. Uncle Bill Simpkins strolled in and took his place near the box of soda-crackers.

"Say, Uncle Bill," they asked him, "would you call Si Perkins a liar?"

"Wall," said Uncle Bill, thoughtfully, as he spat in the stove, "I don't know as I'd go so fur as to call him a liar exactly, leastways not just plain every-day liar, but I do know this much: when feedin' time comes, in order to git any response from his hawgs, he has to git somebody else to call 'em fer him."

It is with no wish to encourage unrest and dissatisfaction with your present invironment that I am here tonight. I come rather as a messenger from a far-off and little-known part of our country, bringing a story of progress and achievement. It is a story in part of kinfolks of ours whose hearts are fired with the same courage, patriotism, and fortitude which enabled our ancestors to wrest a commonwealth from the New England wilderness. They are imbued with high ideals and noble purposes, and by their achievements are establishing us more firmly in our place among the greatest nations of the earth.

THE MIRACLE OF IRRIGATION

The miracle of irrigation, which is performed each year in the arid West, is a most impressive and wonderful manifestation of Nature's beneficence to man.

Throughout the winter season the clouds of heaven are swept hither and thither about the uplifted mountains, whose heads tower a mile above the plain. On their frowning fronts and lofty summits the snows fall heavily, covering deeply every peak and promontory and filling every chasm; then the warm rays of spring and summer sun fall softly upon the white snow-banks and tiny streams, and roaring cataracts burst forth and journey downward to fill to overflowing numerous lakes, each a sapphire gem in the heart of the mountains.

The heavy clouds and towering peaks, the falling snow and gentle sunshine, the rush and whirl of descending waters, these are recurring evidences of nature's maternal contributions to the dweller in the desert.

It remains but for man's industry and intelligence to utilize these generous donations. The engineer finds no field more attractive than this for his energies. He curbs the stream with masonry dams and lifts the water into huge canals. Water and land long divorced are wedded, and wavering fields of grain and orchards prolific beyond comparison replace the wastes of sand and sage-brush.

On three previous occasions I have had the privilege of taking the members of this Society, with the aid of the stereopticon, to view some of the wonders of our Far West, and have shown them some of the work of the government's engineers.* We have looked upon the towering structures of granite and concrete, slowly rising to block abysmal canyons; we have in fancy traveled over highways carved from beetling cliffs and traversing waterless deserts; we have seen the surface of the valleys gashed deeply by broad canals carrying whole rivers to fructify a thirsty land. Tonight, while I shall show you more of these creations of daring engineers, it is also my chief aim to make you more fully acquainted with the real purpose of these great works—the making of homes. One of the best examples of the wisdom of the national irrigation law is afforded by the Huntley project, in Montana.

THE HUNTLEY PROJECT, MONTANA

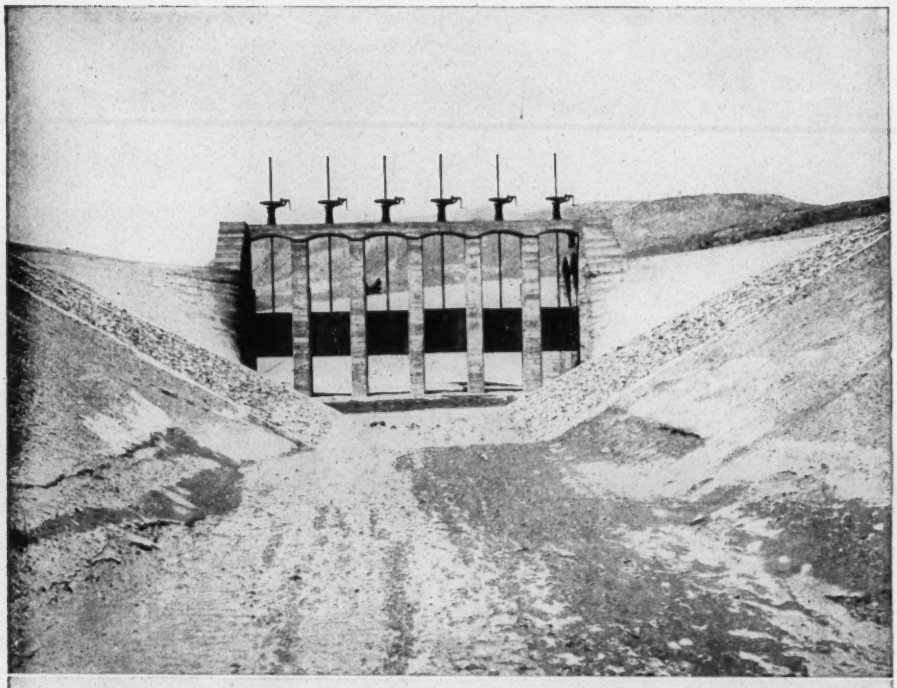
On July 17, 1907, about 30,000 acres of land were thrown open to settlement upon the completion of the irrigation works. This fine tract of land in the valley of the Yellowstone was absolutely virgin; a plow had never scratched its surface. It lay there as nature made it, storing for ages the elements required for plant life. Lacking in rainfall, it produced nothing but sage-brush and bunch grass. To make up for the oversight of nature, a million dollars were expended on irrigation structures and canals. Three hundred families, from all parts of the United States, established themselves upon the 40-acre farms and began at once to erect their simple homes, to clear away the sage-brush, and prepare the lands for crops. To most of them irrigation was an unknown science, to many farming was a new experience. With the cheerful optimism and abiding faith which somehow seem to characterize the dweller in the desert, they set themselves to their several tasks. It was a backward season, a cold, late spring, yet nevertheless every man who sowed reaped some measure of harvest, and in many instances the rewards were beyond reasonable expectation. It is remarkable, but true, that notwithstanding lack of knowledge, unpreparedness of the land, and unfavorable season, not one total failure is recorded; nor has a single individual uttered complaint to the Reclamation Service.

Especially interesting to me are the experiences of those who came to this new country without any previous knowledge of farming. Their successes may well lead us to believe that new avenues of hope are opening to the careworn and discouraged who are living miserably in our crowded cities.

THE MAKING OF PROSPEROUS HOMES

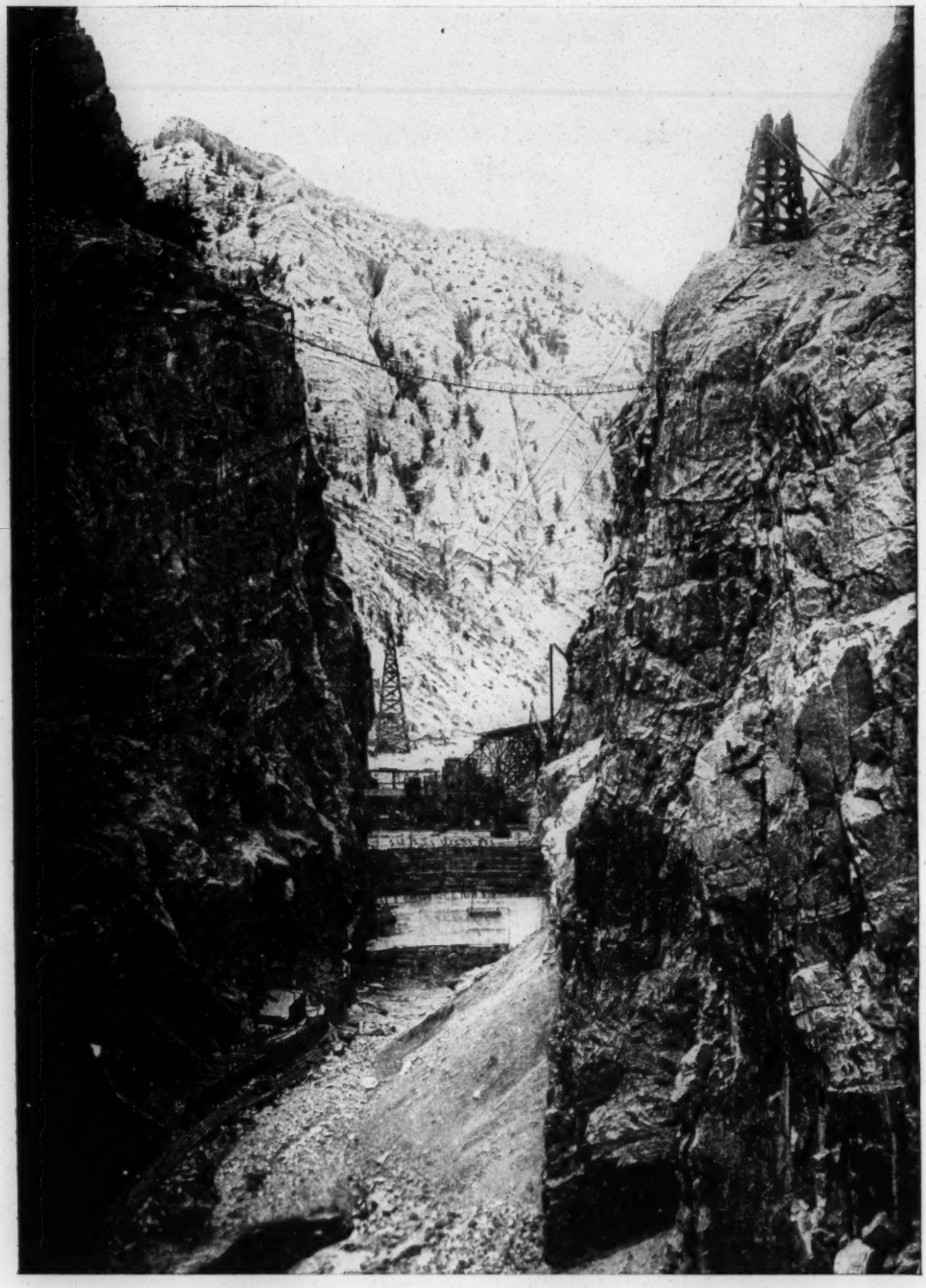
A few years ago a young man, raised on a Pennsylvania farm, came to Washington, D. C., and was enrolled as a stenographer in the Post Office Department. About three years ago he took stock, as it were, and decided that a clerical profession did not suit him. He concluded to improve his annual leave by taking a western trip, and stopped off at Billings, Montana. He was attracted strongly by this progressive young city, and decided to remain. When the Huntley lands were opened, and he took a chance, fortune favored him and he drew a farm of 47 acres, all irrigable. A part of the $1,500, which represented his savings as a government clerk, he paid out at once for the erection of a neat cottage; the sum of $176 was paid for his first installment of water right. A year ago last month the home was ready, and after resigning his job he sent for his family and moved in. He cleared 35 acres of sage-brush, plowed and leveled it, and sowed 24 acres to oats and 4 acres to wheat. He set out 250 apple trees, and between the rows planted 4,000 strawberry plants, potatoes, currants, grapes, strawberries, and blackberries. About the house he set out quick-growing cottonwoods and many junipers. The housewife, meanwhile, did not forget a small flower garden, nor neglect a lot of

* See "Winning the West," February, 1906; "Millions for Moisture," April, 1907; "Homemaking by the Government," April, 1908, NAT. GEOG. MAG.



GATES IN THE MAIN CANAL OF THE TRUCKEE-CARSON PROJECT, NEVADA
(SEE PAGE 427)

A PORTION OF THE CONCRETE-LINED MAIN CANAL OF THE KLAMATH PROJECT, OREGON (SEE PAGE 417)



BUILDING THE HIGHEST MASONRY DAM IN THE WORLD: SHOSHONE DAM, WYOMING

The dam will be of concrete gravity type, 328.4 feet from bed-rock to top of parapet walls; 85 feet long on the bottom; 200 feet long on the top; 108 feet thick on the bottom. It will create a reservoir covering 6,600 acres, with a capacity of 456,000 acre-feet. Water will be used to irrigate about 150,000 acres of land lying 75 miles east of the Yellowstone National Park (see page 411).

fancy chickens. On the first of November he took an inventory for me and reported oats yielding 62 bushels and wheat 30 bushels per acre. Potatoes and other vegetables proved a good crop and furnished enough to carry him through the winter. The apple trees are flourishing, and the outlook for small fruit is most encouraging for 1909. This spring he will plant 30 acres in sugar beets, and he says he can net from $50 to $80 per acre.

Growing tired of the dangerous profession of locomotive engineer, Elmer Eiker resigned and took up a farm at Huntley, where he moved his family, consisting of a wife and three daughters. His capital was about $1,000. He only cleared and cultivated 20 acres, planting an assortment of wheat, oats, sweet corn, potatoes, onions, squash, sugar beets, watermelons, cantaloupes, and other vegetables. It was such a variety that I accused him of making a raid on some Congressman's seed appropriation. Rather remarkable to relate, he was successful with nearly everything he put in the ground. His oats threshed over 45 bushels; wheat, late planted, 18 bushels; potatoes, 150 bushels; onions, 300 bushels per acre; from one-eighth of an acre in cucumbers he sold more than $50 worth. Everything was grown on new land never before touched by a plow. Mr Eiker says any man with three horses, a cow, a few chickens, and $500 in cash, combined with industry and common sense, can make good on one of these 40-acre farms. Several hundred farmers, his neighbors, are doing it. The Huntley project now contains 300 new homes. Its towns are growing. There are eight graded or centralized country schools, four church organizations, and a bank with $50,000 in deposits. Two years ago this country was a sage-brush desert and uninhabited. Last year the first crop was irrigated by water from the new canal system.

THE SHOSHONE PROJECT, WYOMING

Under the protecting shadows of a lofty mountain range in northern Wyoming there is a broad and fertile valley through which flows a strange and wonderful river. In prehistoric days immense geysers along the stream sent their boiling waters high into the air. In the river bed and on the banks great hot springs burst forth, the waters possessing qualities of healing and odors far-reaching. The Indians, who oft renewed their youth in them, called the stream Shoshone, or "stinking water"—an unfair cognomen—for, save at the spring, the river is as clear as a mountain brook and its waters are good to drink.

Unnumbered ages ago there was a beautiful lake, a few miles above the valley, fed by countless streams flowing down from snowy peaks. Between it and the valley a range of lofty mountains intervened. When the lake topped its banks the overflow, passing through some cleft or crevice in the mountain range, during centuries of time gradually chiseled out a canyon eight miles long and hundreds of feet in depth. When the bottom of the canyon was cut below that of the lake, its waters poured out and passed through the gorge and the lake bed was exposed. The entrance of that gorge is only 60 feet wide on the bottom; 300 feet above it is only 200 feet wide. No irrigation engineer could view it without wishing to lock it with a dam. It has been waiting all these years for some one daring enough and with capital enough to block it up and restore once more the beautiful lake that disappeared so long ago.

A BLOCK OF CONCRETE SEVERAL HUNDRED FEET HIGH

In 1910 the lake will reappear, and on its shores countless wild fowl will build their nests. From the depths of the shadowy canyon the world's highest masonry dam is slowly rising, a solid block of concrete, locking securely the perpendicular cliffs of granite and thrusting back the angry floods of the turbulent and torrential river. The work is impressive; it is also attended by many dangers and calls for courage and daring on the part of the men engaged upon it. The scenery is magnificent, the canyon justly ranking with other famous gorges

of the West. The drive over the highway constructed by the Service is one never to be forgotten. As the future route to a new entrance to Yellowstone Park, it will doubtless attract thousands of tourists. The great dam is for storage and for power development. It will hold back flood waters heretofore wasted until needed for irrigation in the summer.

Down the river another dam, a low structure of concrete, diverts the stream into a tunnel 3¼ miles long. This tunnel, passing through the bluffs on the river's edge, emerges at the head of the valley and the waters are carried into a broad canal and thence to the farm lands. Last spring an opening occurred here and 17,000 acres were offered to settlers. Practically all of the farms are taken and many of the newcomers have harvested a crop already. In all my experience in the West I do not recall a more rapid transformation from brown desert to green fields than I saw here last summer. The swiftness with which things grew on this desert soil was positively startling. More than 100 families are now established here and, as on the Huntley, there are no complaints. A second unit of this project, consisting of 13,000 acres, will be made ready for settlers in time for spring planting. At the same time a portion of the lots in the government townsite of Powell will be sold at auction, affording many opportunities for merchants, mechanics, and men of other professions. "The best country I ever lived in" is a common expression on this project.

SUN RIVER PROJECT, MONTANA

To the man who is accustomed to the climate of New England or our Northern States, the attractions and advantages of the Sun River country, near Great Falls, Montana, should appeal strongly. Especially is this true if he be inclined to engage in general farming and raising live stock. The farms on this project are 80 acres of irrigable land, for which the settler must pay for water at the rate of $30 per acre, payable in annual installments, not to exceed ten, without interest. He is also allowed to file on 80 acres of non-irrigable land, for which he pays only the usual filing fee—about $16. The unirrigated land can be utilized for pasture, corrals, and buildings. Back of the irrigated lands is a vast area of free range covered with nutritious grass in the summer and furnishing forage for vast flocks and herds which in the winter consume the crops grown by irrigation. Owing to the fact that the project is at present some miles from a railroad, settlement has been slower here than elsewhere. The time is not far distant when a new railroad will be extended into the valley, and it is expected that settlement will then be more rapid.

LOWER YELLOWSTONE PROJECT, MONTANA-NORTH DAKOTA

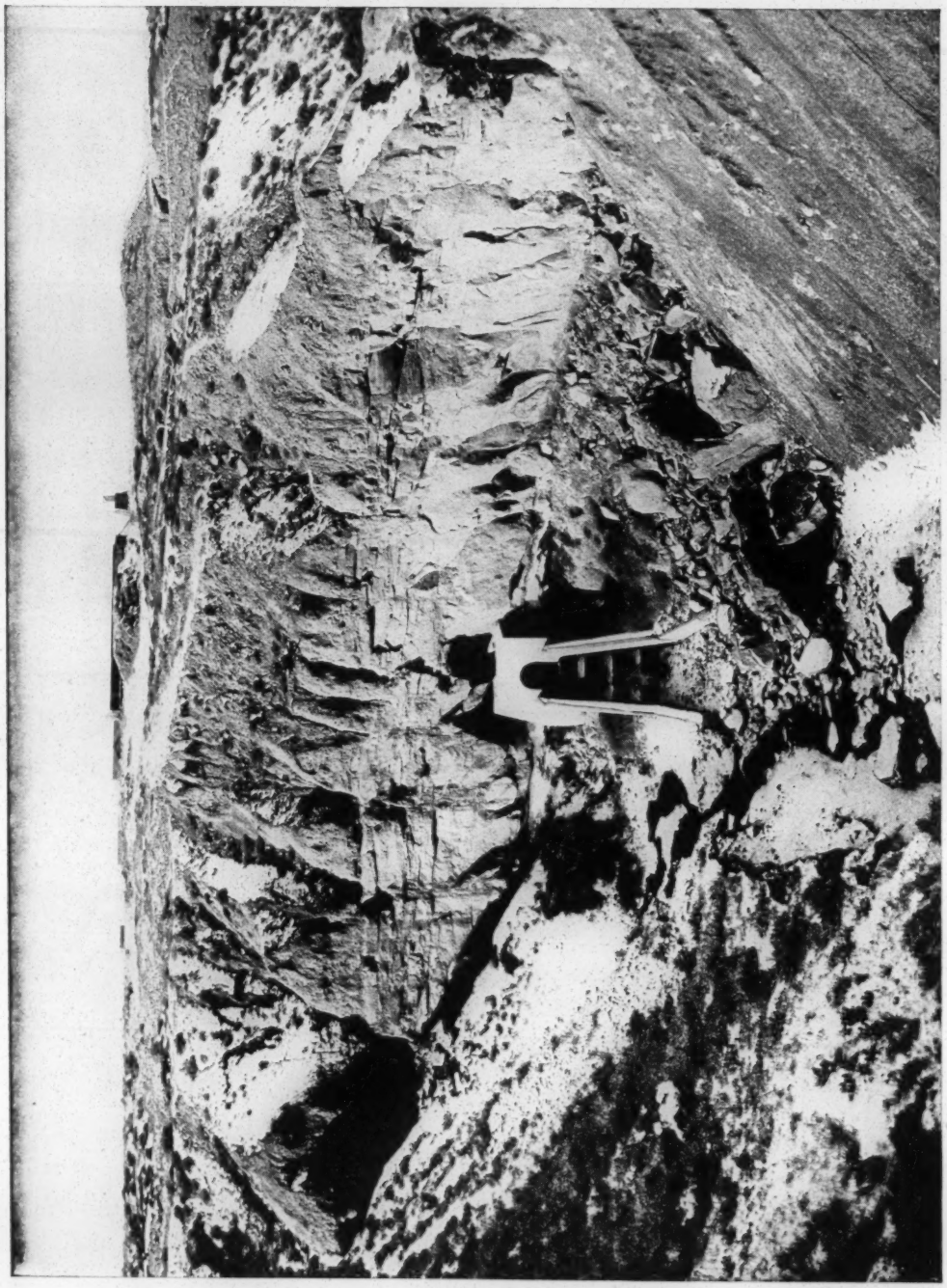
A short time ago the Lower Yellowstone project, embracing 66,000 acres in Montana-North Dakota, was formally opened. A large part of the land is already filed upon. Owing to the very favorable season, many settlers raised good crops of grain last year without irrigation. As a rule they have all prospered, and the outlook for this section of the Yellowstone Valley may be regarded as propitious.

Among the first settlers on the government land on this project was a tall, rawboned young man, a wood-polisher from Buffalo, New York, who filed on 160 acres near Sidney. He landed with exactly $50 in his pocket. Securing employment as a teamster, he saved his salary until he bought a team and wagon of his own, and then secured a contract for hauling supplies. He has now nine good horses and two wagons. On his farm he has erected a good house, has fenced his land, and will henceforth devote his time to harvesting bountiful crops. He has done all this within three years.

OTHER MONTANA PROJECTS

Montana, owing to its very large areas of public domain and its splendid water supply, is a most inviting field for the engineer. The early opening of three

RELICS OF OLD ARIZONA: THE APACHE AND THE CACTUS (SEE PAGE 426)



LOWER PORTAL CORBETT TUNNEL: SHOSHONE PROJECT, WYOMING

This tunnel is 3¼ miles in length, has a cross-section of 10 x 10, and a capacity of 450,000 gallons per minute

Indian reservations will make available for development a hundred thousand acres of choice land in the future.

On the Milk River project, in this state, the government is at work on a large dam at Dodson, while the farmers themselves have undertaken and are successfully building the largest irrigation canal in the United States. On the Saint Marys project, the water supply of which has been made the subject of a treaty not yet ratified, the work of canal building is being done largely by Indian labor. The Indians will be employed to build their own ditches on the Flathead and Fort Peck reservations as soon as plans are decided upon.

Preliminary surveys have been made on this project and an irrigation system designed to supply 130,000 acres of land on the Flathead Indian reservation, in Flathead, Sanders, and Missoula counties. Work will be carried on during the season of 1909 on four units—the Jocko unit covering 6,000 acres; the Mission, 4,500 acres; the Polson, 3,000, and the Mud Creek, 6,000 acres. The Indian allotments amount to 80 acres of irrigable land for each individual. The lands remaining after all the allotments are made will be opened to the public after due notice has been given by the Secretary of the Interior through the public press.

The lands lie about 2,800 feet above sea level, and the temperature ranges from 20° below to 100° above zero. The soil is clay, forest loam, and gravelly loam, and the products are alfalfa, grain, vegetables, apples, and small fruits. The project is located between the Great Northern and the Northern Pacific railroads.

THE NATIONAL IRRIGATION PROJECTS OF WASHINGTON

In the minds of most Easterners the northwest boundaries of our country are usually associated with blizzards and a temperature that puts the average thermometer out of business. There are places along the border where the winds blow and 50 degrees below zero is not uncommon. Again there are places where the seasons are so genial, the temperature so favorable, that delicate fruits like apricots and peaches are grown successfully. Close to the Canadian line, in Washington, is a remarkable valley, shut in by sheltering hills and mountains and favored with the kindly Chinook winds. It is known as the Okanogan Valley, sometimes called the California of the Northwest.

It richly deserves the name, for it is the boast of its early settlers that no killing frost has ever destroyed the orchards in that valley. The reclamation project here is the most expensive per acre of any of those now in process of construction. So abundant are the yields and so profitable and varied are the crops that the land-owners very cheerfully entered into a contract with the government to pay a charge of $65 per acre for a water right. The assurance of a constant and sufficient supply of water for irrigation has increased land values tremendously. Prices here to the Easterner seem very high until the earning capacity of the lands is demonstrated. The Okanogan Valley sent an exhibit of fruits to the Industrial Fair at Spokane last fall. Out of 23 plate exhibits the county drew 19 prizes.

Eight years ago James O'Herin, a shrewd Yankee from Portland, Maine, came to the valley seeking a home. He had $500, and filed upon a homestead which he commuted, and in 1905 sold it for $10,000. This sum he immediately invested in another ranch, which in three years' time he has so improved as to be worth more than $20,000. From a tenant farmer in the East to a land-owner worth $20,000 in eight years may be taken to indicate the possibilities which await the industrious and intelligent home-seeker in the arid West.

IN THE VALE OF PLENTY

Southward and near the line dividing Oregon and Washington is the great Yakima Valley, beyond question the most widely advertised and best known agricultural region in the Northwest. It is

Washington's vale of plenty. The fame of its prodigious crops, the excellence of its fruits, and the general prosperity of all of its people are subjects of fascinating interest. The valley may be said to have been absorbed by the Service, which in the interest of economy has acquired the principal irrigation system and controls the entire flood flow of the stream. The plans provide for a gradual and comprehensive development of several hundred thousand acres of land of unequaled richness. The work is now centered upon two units—the Tieton and Sunnyside—but in the near future the Wapato unit, embracing the Yakima Indian lands, will be opened to settlement.

At the risk of losing my reputation for veracity I wish to mention a few of the numerous instances of success on the part of horticulturists in that valley.

J. O. Shadbolt, for ten years a dry-goods merchant of Virginia, Minnesota, came to Wapato, Washington, in February, 1906, and bought 41 acres, all in bearing orchard, including apples, peaches, pears, plums, apricots, and cherries. He paid $18,500 for the place, or a little over $450 per acre, a price which his friends declared was evidence that he was crazy. He added $2,500 for improvements, making an initial investment of $21,000. In 1908 Mr Shadbolt refused a definite offer of $50,000 for his ranch. Let us briefly analyze the crops produced in the three years he has owned the ranch. In 1906 his sales were as follows:

6,933 boxes Bartlett pears	$6,612.00
2,652 boxes Crawford peaches	1,326.00
8,743 boxes Elbuta peaches	5,245.80
Over-ripe pears sold at home	250.00
4,243 boxes plums, apples, apricots, and cherries	3,023.72
Total	$16,457.52

Deducting operating expenses, about 25 per cent, left a net profit of $12,000.

In 1907 the orchard yielded gross, $29,485.47, and net, $20,500.

In 1908 the business depression affected the market and prices were lower; nevertheless the orchard netted $7,500. In the three years former shopkeeper Shadbolt, who never before had any knowledge of fruit-raising or irrigation, has netted $39,500 on an investment of $21,000, or an average of $13,166 annually. His net income each year has exceeded 62 per cent on his investment. His annual net returns averaged over $321.13 per acre.

Edgar Silvers, from an unirrigated farm near Albion, Nebraska, came to Toppenish six years ago and bought a ten-acre farm under the government canal. He has now 7½ acres in bearing orchard and 2½ acres in young trees. From his matured trees last year and from the vegetables and clover grown between the rows he received $2,727.60 gross. He says this beats 160 acres in the corn belt in net yields, besides being a lot less worry and hard work.

From 9 acres of apples, or 660 trees, A. Larson, of Zillah Post Office, a former citizen of Stockton, Wisconsin, sold $3,755 worth in 1908.

L. I. Barbee, a former resident of Red Oak, Iowa, now living on a 20-acre ranch at Toppenish, sold $2,341.60 worth of apples, pears, plums, and prunes from 357 trees, or more than $6.50 per tree. These trees occupy 6½ acres.

J. C. Milton, also from Red Oak, Iowa, now owner of 6 1-3 acres in apples and peaches, harvested from 300 trees $2,578.55 worth of fruit in 1908, or nearly $8.60 per tree. His average gross return was $407.14 per acre.

Robert McCormick, formerly a lumber-jack at Blue Earth, Minnesota, landed in Zillah ten years ago with just 75 cents in his pocket. For two years he worked as laborer and teamster, and then with his savings made the first payment on 25 acres under the government's canal. It was raw land then, covered with sagebrush. Today it is all in cultivation, and his little farm is bringing him in each year $2,000 above all expenses. Last year he picked 780 boxes of apples from 1¼ acres. He has refused $1.25 per box, or $975 for his crops, which indicates a yield of $780 per acre.

COMMUNAL FARM LIFE IN OREGON

Between the Umatilla River on the west and the Columbia River on the north, in northwestern Oregon, is a broad expanse of sage-brush desert which is now undergoing a remarkable transformation. The irrigation works of the government here consist of a diversion dam in the Umatilla River a few miles above the town of Echo and a storage feed canal, 20 miles in length, carrying the flood flow of the stream into a large reservoir, having a surface area of 1,700 acres and a depth of 70 feet. From the reservoir a series of canals have been extended to embrace about 20,000 acres of exceedingly fine land. The productivity of this section has long been known through the profitable crops under small private ditches. Agricultural experts all agree that this valley has a most promising future. At no distant day we may confidently look for one of the most compact agricultural districts in the state to be established here. The soil is of great depth, the summer comes early, and the growing season is longer than in most parts of the West. The truck and fruit grower can place his crops on the markets in advance of his competitors, and be sure of top prices in the markets of Spokane, Seattle, Tacoma, and Portland, all of which are tributary by rail or water transportation.

An interesting phase of the development here is the combination of urban and rural life; farms are small; many five and ten-acre orchard tracts are being laid out about the towns, and the owners of many of these have built their homes in the towns, so that their wives and children have the advantages of society, schools, and churches.

THE KLAMATH PROJECT

In the land of "Burnt Out Fires"—the region which will long be remembered as the last stronghold of the Modoc Indians—is a remarkable agricultural district known as the Klamath Basin, which lies partly in California and partly in Oregon, and embraces several hundred thousand acres. The first unit of this important national irrigation work is completed, and several thousand acres of fertile land are now receiving water from the government canals. Of all the Federal works, Klamath project is, perhaps, the most unique, by reason of the fact that it involves irrigation and drainage in unusual combination. A considerable portion of the lands to be irrigated is today covered with the waters of navigable lakes; these waters are to be drawn off and the exposed lake beds are then to be subdivided into farms and irrigated by the government canals.

A new railroad has been completed to the valley, and the indications are that this region is to enjoy rapid growth and development. Its advantages in soil, climate, and products, as well as in great undeveloped natural resources—in forests, water power, and free grazing—are certain to attract enterprising citizens from all parts of the country.

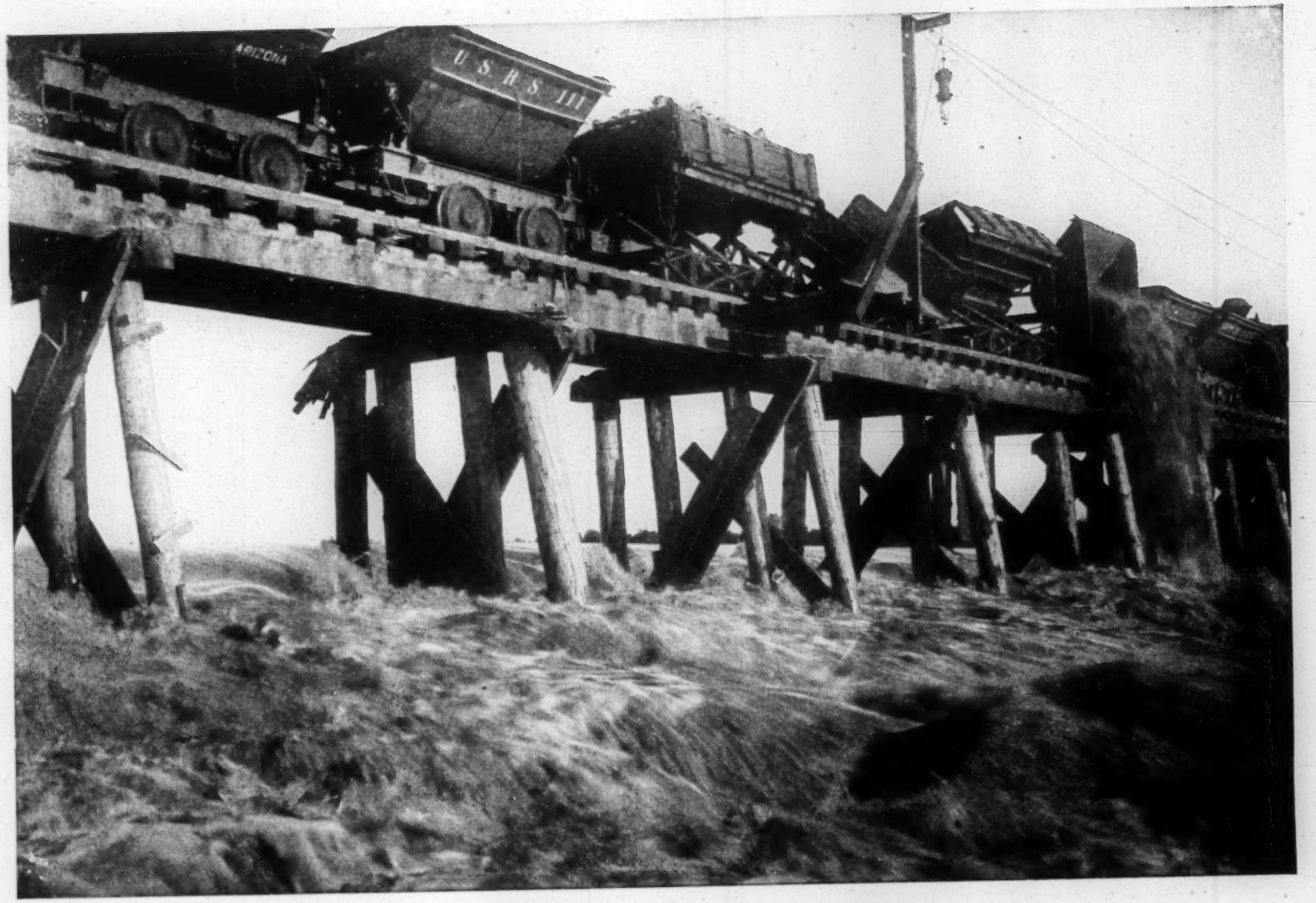
IDAHO'S WONDERFUL DEVELOPMENT

The most important stream in the arid West is Snake River, in Idaho. From the foothills of the Tetons, which form the boundaries of Wyoming and Idaho, to the western boundary of the latter state, Snake River traverses a wide lava plain which constitutes the most interesting and important physiographic feature of the southern part of the state. Snake River now irrigates a larger area than any other stream in the United States. Two reclamation projects of the government have been undertaken in this drainage basin, one supplied from the main stream and the other from two important tributaries.

The Minidoka project, in the southern part of the state, was partly completed in 1907, and made available for entry 1,050 farms, varying from 40 to 80 acres each. Before the water was ready every farm was filed upon, and 5,000 people established homes in the sage-brush. The most important feature of construction is the rock-fill dam across the river, a structure 650 feet long on top and 50

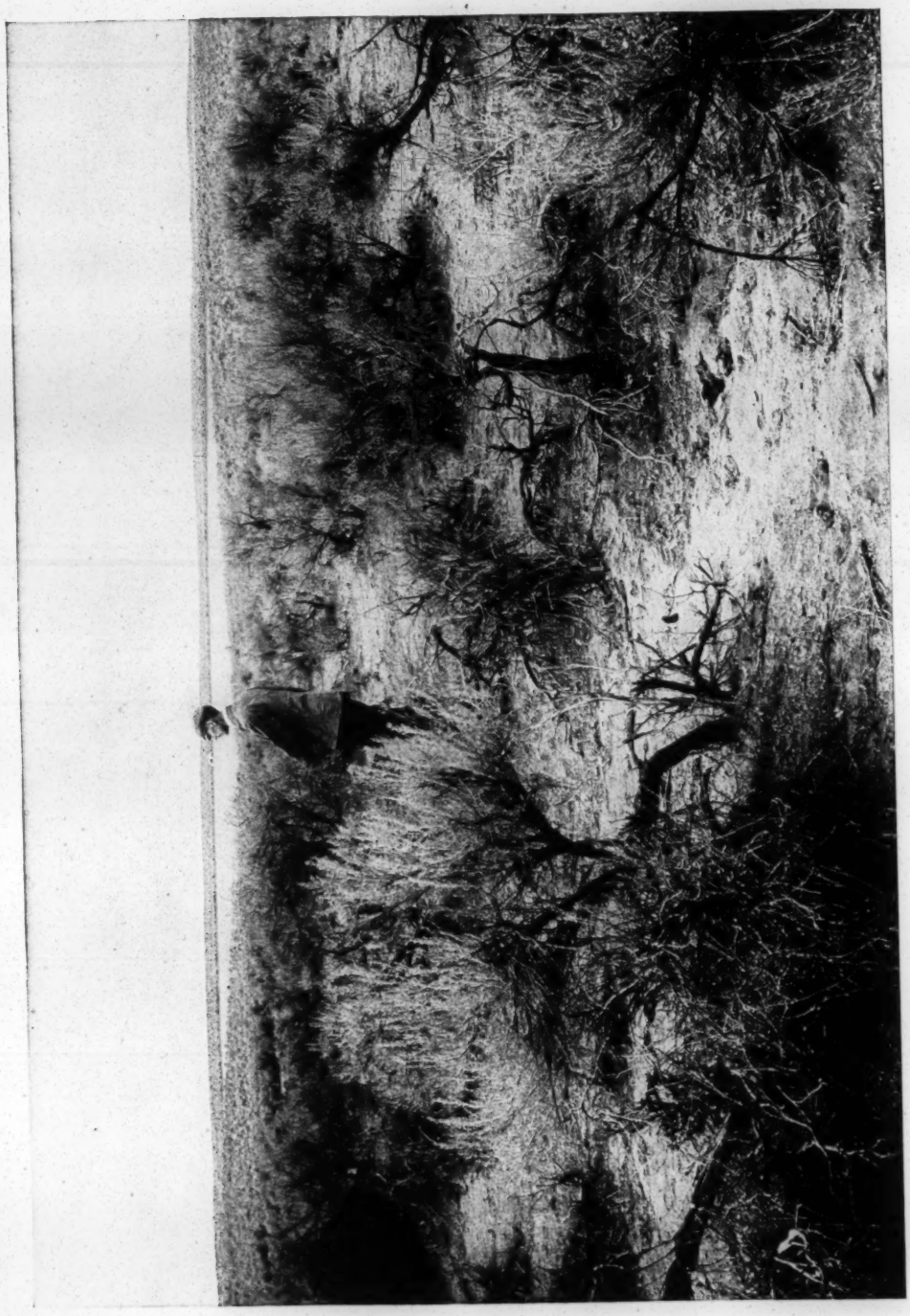
THE PATHFINDER DAM OF THE NORTH PLATTE PROJECT (SEE PAGE 427)

This structure will be 215 feet high and will create an enormous reservoir, with a storage capacity of 1,025,000 acre-feet, or enough water to cover 1,025,000 acres a foot deep. It will be completed May 1, 1909, and will cost $975,000

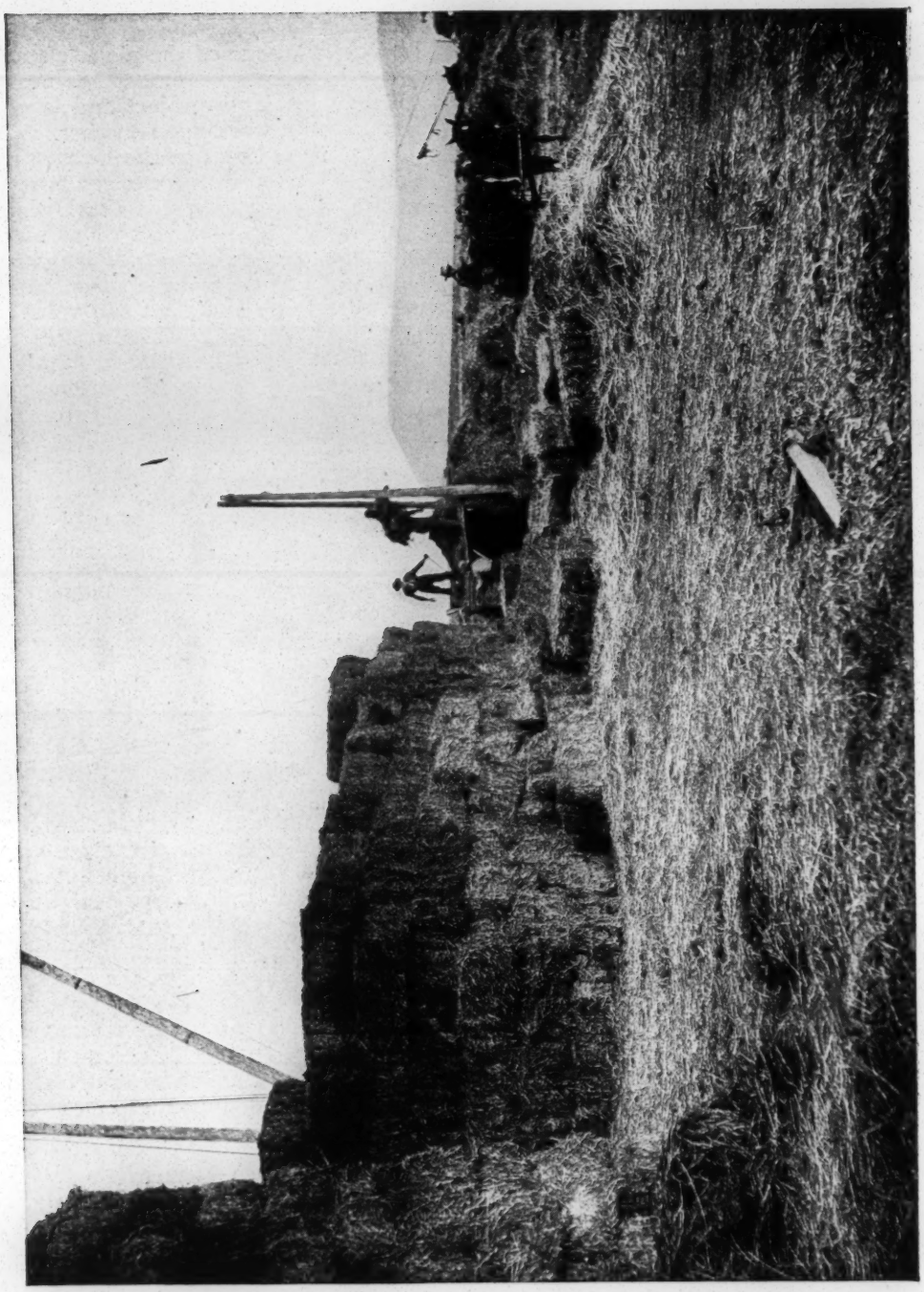


CLOSING COLORADO RIVER DURING CONSTRUCTION OF LAGUNA DAM, YUMA PROJECT, ARIZONA-CALIFORNIA

Nearly 72,000 cubic yards of material were dumped into the stream before the closure was effected. The Laguna dam now completed is 4,780 feet long, 19 feet high, and weighs 600,000 tons



A STRETCH OF SAGE-BRUSH DESERT BEFORE IT WAS LAID OUT IN FIVE-ACRE TRACTS FOR CULTIVATION: UMATILLA PROJECT, OREGON (SEE PAGE 417)



BALING HAY IN OREGON ON THE FORMER SAGE-BRUSH DESERT

feet high. On each side large canals take the water out upon 130,000 acres of desert land. This section of Idaho has been widely advertised, and contains several of the largest irrigation enterprises ever built by private capital. What was astually an uninhabited sage-brush plain in 1902 now contains probably more than 20,000 people, and its development has only just begun. If the storage supply proves adequate, not less than a million acres of exceptionally fine land will be brought under cultivation, and this one section will then support a population equal to that of the entire state.

Nearly 400,000 acres of fertile land in the valleys of the Payette and Boise rivers, in southwestern Idaho, are embraced in a reclamation project. This is a most attractive region and practically all of the public lands have been taken up. With its advantages of soil, climate, and crops, these valleys will support in comfort a large population. The progress made here in the last three years presages nearly ideal conditions of rural life. Trolley lines and telephones now connect many of the farms with the growing cities. It is possible even now to live in the country 25 miles from the city and enjoy many of the advantages of the latter. On February 22 of this year the people of the valley formally celebrated the opening of the first important unit of this work. In the presence of several thousand people the gates of the big Boise dam were closed and the waters turned into a huge canal. The Boise dam is 400 feet long on top and 45 feet in height. An important feature of this project is the Deerflat reservoir, which was created by building two very large earthen dams inclosing a depression between the hills. One of these dams is 4,000 feet long and 70 feet high; the other 7,200 feet long and 40 feet high. The total quantity of earth and gravel in these dams is 1,088,800 cubic yards. The main canals in this project will have a total length of 400 miles.

IN PROSPEROUS COLORADO

In Colorado, one of the pioneer states in irrigation, the government has nearly completed one large project and is preparing to begin work upon another. The first of these is kown as the Uncompahgre and is located in the western part of the state. In the valley of the Uncompahgre are many thousands of acres of fertile land, easy of access for irrigation canals, wanting only the application of water to produce abundant and valuable crops. Unfortunately this stream is deficient in flow and erratic in regimen. The canal systems in use were often short of water, and crops and valuable orchards frequently suffered from drouth. At a distance sufficiently near to be tantalizing flows the Gunnison with an unfailing supply, little of which can be used in its own valley. The two rivers flow in nearly parallel courses for many miles, separated by ranges of rugged hills 2,000 feet high, forming some of the roughest country in the West. The problem of uniting the waters of these two rivers was often discussed by engineers, but practical plans were never formulated until a daring engineer of the Service, at the peril of his life, made the necessary preliminary surveys.

For many miles in its course the Gunnison rushes through a box canyon, with walls in places 3,000 feet high. A portion of this profound gorge had never been explored until the government engineer accomplished the feat. The preliminary survey, which was made during that wild trip down the river, showed that the elevation of the Gunnison was higher than that of the Uncompahgre, and proved the feasibility of transferring some of the waters of that stream by means of a tunnel passing under the mountain. It was a stupendous task, involving an enormous outlay of money and taxing engineering skill and ingenuity to the limit. The work of final survey and location was most perilous, owing to the necessity of making a topographic map of the canyon and estab-

lishing precise levels at both ends of the tunnel. Before construction could be begun a road was built into the canyon so that heavy machinery could be brought in. A town sprang up at the bottom of the rock-walled chasm, a power plant was erected, and after many months of weary labor the drills began to eat into the granite. On the other side of the mountain another town was established and similar work commenced.

The total length of the tunnel will be nearly six miles, of which five and a half miles are now completed. Throughout the entire period of construction the work has been attended with difficulty and danger; gas, cave-ins, and subterranean springs of hot and cold water have interposed obstacles, delaying the work and requiring the utmost care in its prosecution.

The Uncompahgre Valley has been getting ready for the coming of this new water supply in 1910, which will make fruitful 150,000 acres of desert, and which will ultimately become one of the rich agricultural and horticultural districts of this continent.

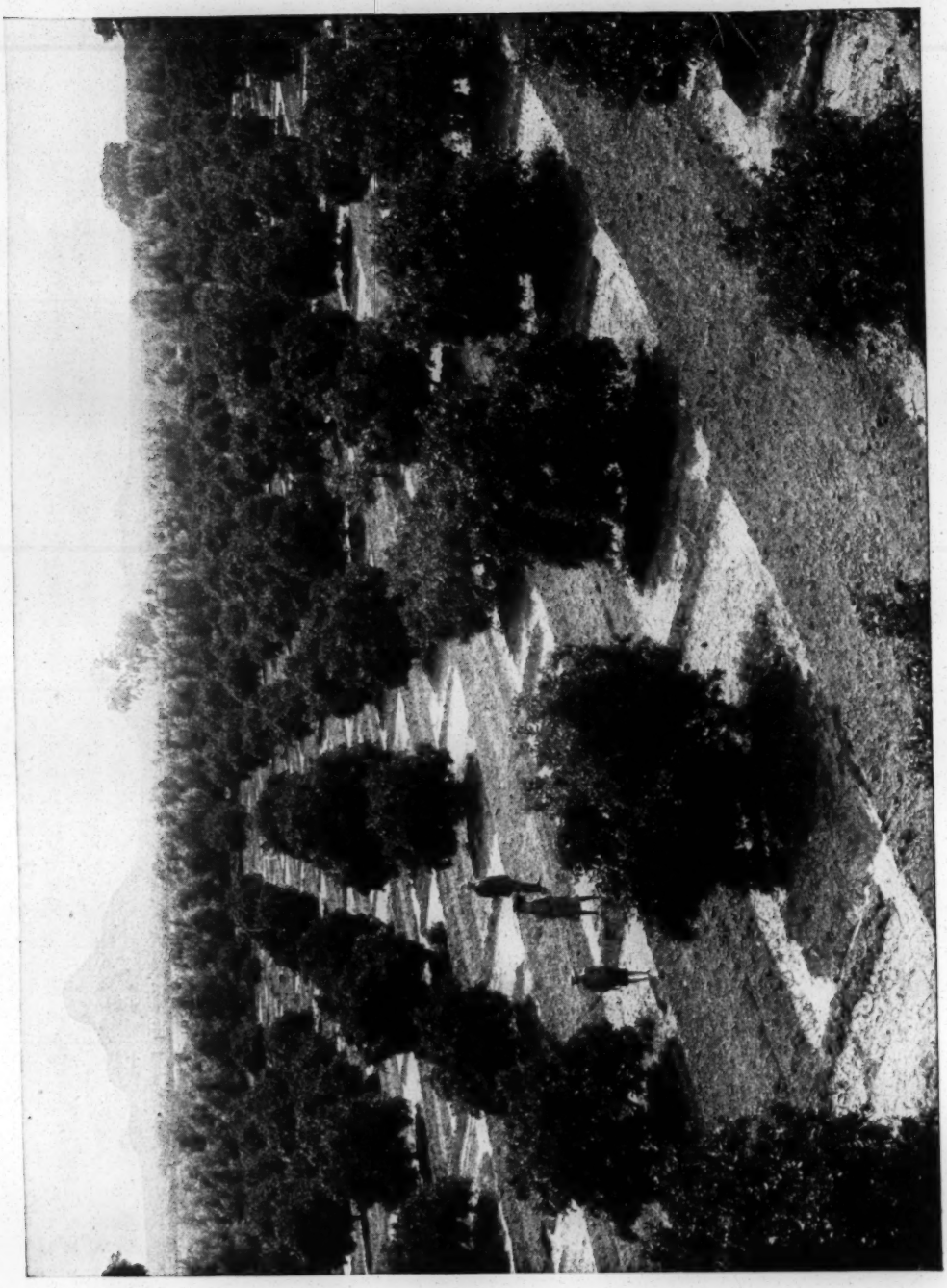
Colorado's second reclamation project is located in the vicinity of Grand Junction and embraces some 50,000 acres of the best land in the famous Grand Valley—one of the most favorably situated agricultural valleys in the world. This is a region where scientific fruit-growing is the rule and not the exception, and as a result of the enterprise and intelligence of its farmers fruit lands here have a higher value than anywhere else on the globe. The climate, soil, and elevation are alike adapted to the growing of a variety of products which in perfection, color, and flavor are unexcelled. It requires no particular gift of prophecy to foretell that when the works are completed this valley will become one of the nation's show places. The farms will be small in area, making the settlements compact; intensive agriculture will be extended, and large areas in high-priced fruits will be cultivated. With cheap water power right at hand, trolley lines will be extended to all parts of the valley, affording facilities for cheap and ready marketing of all products. There is no reason why farm life will not ultimately become more nearly suburban than rural in character.

The opportunities which exist here for making a farmer's life attractive will not be overlooked. We may confidently look for a citified country. Constant contact and association with his neighbors will bring about coöperation among the farmers both in producing and marketing the farm products.

This is not a picture of fancy; it is not a dream of Utopia; rather is it the inevitable result of intensive and scientific cultivation of small farms, each occupied by its owner and family.

THE COLORADO RIVER AND ITS PROBLEMS

The Colorado River, its watershed and its wonderful delta, have long been subjects of engrossing interest to the engineers of the West. The desert of this river is a distinctive feature in a region full of natural wonders. A large portion of it lies below sea level, and in recent geologic period was the bed of the ocean. From earliest time this great stream, rising in the mountain fastnesses of distant Wyoming, Colorado, and Utah, has been carving out a canyon through an elevated plateau more than a mile deep in places and unrivaled anywhere in the world in scenic grandeur. During countless ages the Colorado has been grinding to powder incalculable quantities of rock and soil, building up a broad valley with sedimentary deposits, and elevating its bed above the level of the desert through which it flows. As a whole, the Colorado River probably offers the most interesting as well as the most stupendous engineering problem which exists in arid America today. Solve it successfully, and a million acres of desert in this country and half a million acres in Mexico will furnish homes for more than a million people. No power save that of the Federal government can cope successfully with this problem. Mexico will doubtless be willing to share her proportionate part in the expense of storage



IRRIGATED ORANGE GROVES IN THE SALT RIVER VALLEY, NEAR PHOENIX, ARIZONA (SEE PAGE 425)

for water to be utilized on lands belonging to that Republic. The problem involves interstate as well as international features, and will require the expenditure of a sum of money great enough to make the work comparable with the largest schemes for irrigation attempted by England in Egypt or India. From its headwaters in Utah, Wyoming, Colorado, and Arizona to the rainless delta, the river must be absolutely controlled. Enormous reservoirs must be created by building dams in the mountain regions to store the floods, and hundreds of miles of canals must be laid out to carry the water upon a sleeping empire.

The Colorado desert is a region unique and wonderful. Potentially, it is greater than any area of its size in the world. The fertility of its soil, its climatic adaptability to unusual crops as well as many staples, make it one of absorbing interest to the agricultural scientists. The first important step has been taken by our government for the subjugation of the Colorado. A few weeks ago the engineers of the Service, after two years of difficult labor, succeeded in placing a dam across this intractable river. As if resentful of any attempt to check it in its mad course to the Gulf, the Colorado rose in flood to oppose the engineers. The final struggle was of many hours' duration and full of excitement and danger to an army of men who fought bravely for hours against the rising wall of angry waters. The coffer-dams held fast and the Colorado was safely turned at last into the enormous sluiceways on either side. Today a solid wall of stone and concrete 4,780 feet long and 250 feet wide, tied to enduring hills of rock on either end, rests in the channel. Man has again conquered the forces of nature, and a mighty river, never before controlled, is now a servant to his hand. During the present summer 17,000 acres will be opened to settlers on this project, the lands lying in California.

IN AMERICA'S EGYPT

Arizona is America's Egypt, but, unlike the land of the Pharoahs, whose secrets are revealed to us in hieroglyphics which our wise men have learned to read, the history of the ruined cities of our Southwest and the race that built them is yet unfathomed.

This is our land of mystery and enchantment, where nature has painted the landscapes with the rainbow's hues. It is the land of the painted desert, with its inspiring scenery and colors; it is the land of the Grand Canyon, Nature's architectural masterpiece, the Titan of chasms; the land of the meteoric mountain and the petrified forests. With resources of soil, minerals, and forests as varied as the wonderful colors of the landscape; with every gradation of climate from north temperate to semitropic; with an area double that of New England and a population less than that of the city of Washington, Arizona is yet practically undeveloped and almost unexplored.

Over its vast expanses of divinely tinted desert wander the Bedouins of the United States. Here and there on the higher mesas, or beside the deeply eroded waterways, dwell the strangest people on our continent.

This land of mystic dreams, of lost races and crumbling ruins, is awakening to the touch of modern civilization. The streams that once swept on unchecked through gorge and canyon are now being spread upon a thirsty land, and emerald-tinted oases are dotting landscapes which for ages were barren and desolate.

After the long and dusty ride across Arizona the traveler who awakes in Phœnix in the early morning feels transported into a new world. He is in a land where vegetation is almost tropic in its splendor and luxuriance. Here are avenues of palms whose spreading branches bend in graceful curves. Here the orange, the lemon, the olive, and the pomelo attain perfection in color and flavor. The date palm, laden with luscious fruit, the bread of the desert; the delicious fig, the almond, and countless other donations of generous nature are seen on every hand. Broad fields of alfalfa, yielding eight tons to the acre; bumper yields of grain, veg-

etables, and small fruit reward the man with the hoe in this land of sunshine and plenty. The soil's response to tillage and moisture is immediate—yea, almost miraculous.

But earth grants no harvest here without labor and expense. The desert, vast and forbidding, is near and threatening. Its threat of desolation is vitalizing; it energizes the man who engages in the combat. It thrusts its boundaries to the very edge of the irrigation canal which embraces the oasis. More than once in early days, when the river failed, the desert swept across the ditch and engulfed the fields and orchards. Such disasters emphasized the need for an assured water supply and led to the initiation of one of the most stupendous irrigation projects of our time in Salt River Valley.

THE MOST DIFFICULT OF ALL PROJECTS

In the variety of the engineering problems, in the magnitude of the works, and in the extraordinary character and number of difficulties surmounted in prosecuting the work, the Salt River project ranks first among the works of the Reclamation Service.

A few of these difficulties are made manifest by an inspection of the country in which the work is going on. The Salt River for a number of years furnished an inadequate supply of water for the needs of the farmers. At times great floods destroyed important headworks and caused heavy losses until the necessary repairs could not be made for lack of money. Near the headwaters, in an almost inaccessible mountain region, was one of the best natural reservoir sites in the West. To develop it involved an expenditure so vast that it was beyond the means of the community to attempt it. Congress enacted the Reclamation Law and the Reclamation Service took up the great work.

For 20 miles across a desert of cacti and mesquite, an absolutely waterless plain, a broad highway was laid out to the foot of the mountains. For 40 miles further into the most rugged mountain country in the West the road was blasted from the rocks.

In scenic beauty and in artistic and changeful coloring no highway in the West compares with it. The mountains are inspiring and the rocks are clothed in richest colors. No language can describe the glories of the sunrise or sunset pictures on those crags and cliffs, or the witching beauty of the deep canyons veiled in purple shadows. It is a drive, once taken, never to be forgotten.

The entrance to the canyon which Salt River has cut through the mountains was selected as the site of a dam. This structure in many respects will be one of the great engineering works of the age. At its base it covers an acre of ground. It will rise 284 feet from foundation to parapet and on top it will be 1,080 feet in length. To erect such a structure in a region so remote from transportation involved many difficulties. It was necessary for the engineers to qualify in many capacities. The government developed its own power by constructing a power dam 19 miles up the river and turning the water into a canal which was lined for miles with cement. A drop of 220 feet above the big dam furnished 4,000 horse-power, which was utilized for many purposes.

The engineers operated a cement mill which has turned out to date more than 100,000 barrels of first-class cement. Saw-mills were set up in the national forest, 30 miles away, and several million feet of lumber were cut and hauled to the works. Two farms were cultivated to supply forage and provisions, hogs and beef. Water works and electric light plants were established. A city of 2,000 people sprang up in the valley—a town of transient renown, for it has already nearly disappeared. For laborers the government turned to the Indians living in the mountains. Though many of them were Apaches, they proved tractable and industrious, and it was largely by their labor that the remarkable highway was constructed. From the big dam and from drops in the canal 26,000 horse-power will be developed. A part of it will be transmitted to the Sacaton Indian reservation to pump water from wells upon 8,000 acres belonging to the Pima In-

dians—an act of justice long postponed, for the tribe was beggared by the robbery of their water supply by white men.

ORLAND PROJECT, CALIFORNIA

This project involves the reclamation of 12,000 acres of land lying about 90 miles north of Sacramento, in Glenn and Tehama counties. The only town within the territory to be irrigated is Orland, on the Southern Pacific Railroad. The lands are exceedingly fertile, and for many years have been cultivated and utilized for wheat growing. With irrigation and the prevailing climatic conditions, however, it has been demonstrated that the land is unequaled for the production of alfalfa, nuts, and both citrus and deciduous fruits. Preliminary work on this project is practically completed, and advertisement for bids for building the East Park dam and spillway will be made in the near future. Many of the farmers are pledged to dispose of their holdings in excess of 160 acres to those who wish to take them under the reclamation project.

GARDEN CITY PROJECT, KANSAS

This project consists of a pumping system for the recovery of underground waters, which are delivered into a conduit leading to an old distributing canal, known as the Farmers' Ditch. The plant consists of twenty-three pumping stations, each driven electrically from a central power station. There are 10,656 acres of irrigable land in the project, lying in the vicinity of Garden City, on the north side of Arkansas River, townships 22 to 24 south, ranges 32 to 35 west, sixth principal meridian, Finney County.

The lands are all in private ownership, but there are some excess holdings for sale. The soil is a rich prairie loam, capable of the highest cultivation, and well adapted to the raising of grain, sugar beets, cantaloupes, alfalfa, and other crops of the plains region. The average elevation of the area under this project is 2,025 feet above sea level, and the temperature ranges from 20° below to 105° above zero. The Atchison, Topeka, and Santa Fé Railway furnishes transportation for the products to the local markets and to Chicago and Kansas City. The water-right charge is $35 per acre of irrigable land, and the farmers are also required to pay an annual maintenance and operation fee, which at present amounts to $2.75 per acre.

NORTH PLATTE PROJECT, NEBRASKA-WYOMING

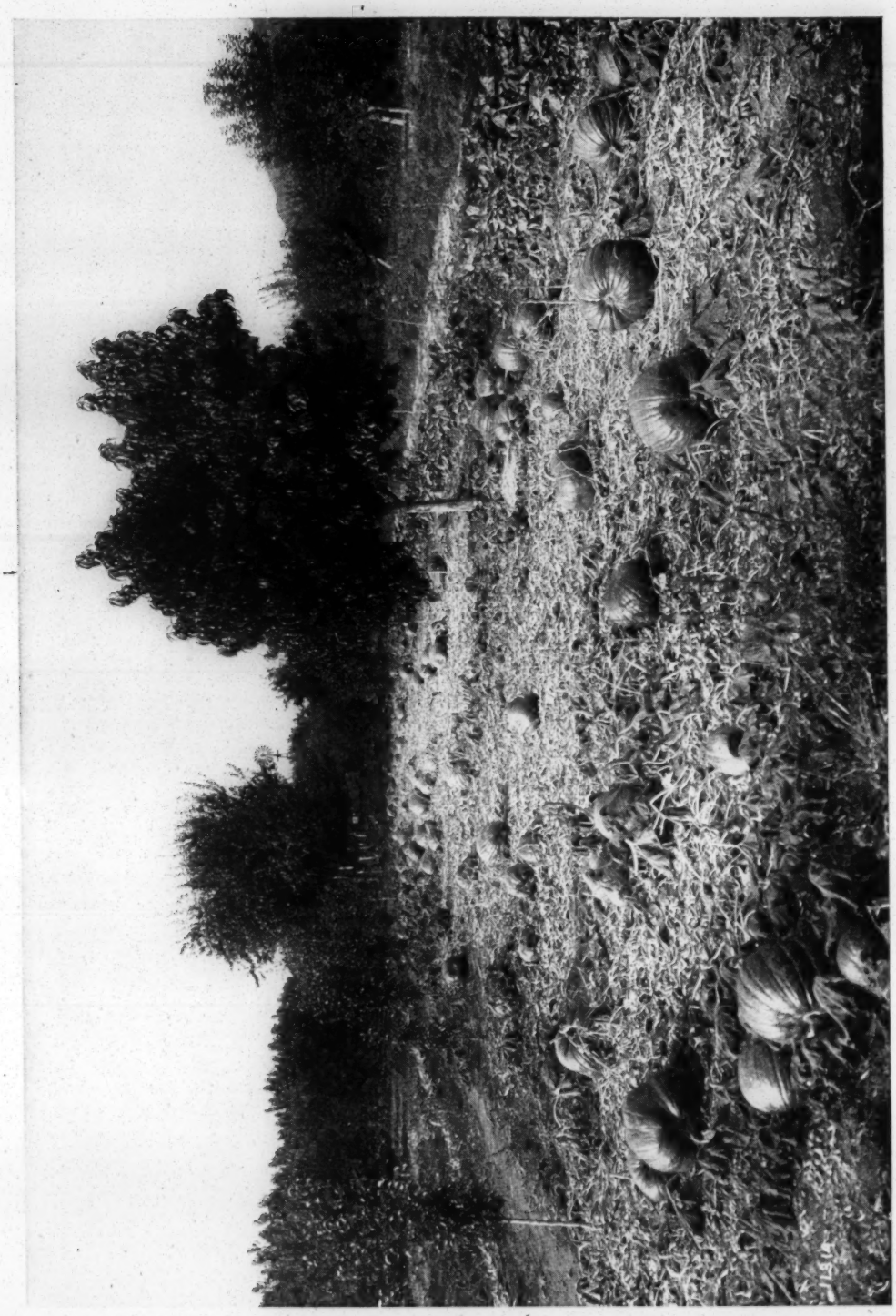
This project is located about 100 miles north of Cheyenne, Wyoming, and extends along the North Platte River. About 60,000 acres of land, practically all of which has been filed upon, will be supplied with water in 1909. The land is tributary to the Chicago and Northwestern, Burlington and Missouri River, and Union Pacific railroads. The average elevation is 4,100 feet above sea-level, and the temperature ranges from 25° below to 100° above zero. The average annual rainfall on the irrigable area is about 15 inches.

The soil is a fertile, sandy loam, quite free from alkali, and requiring 2½ acre-feet of water per acre per annum. Alfalfa is the principal crop, but cereals, sugar beets, and potatoes are successfully grown. Excellent range country borders the irrigable lands in Wyoming.

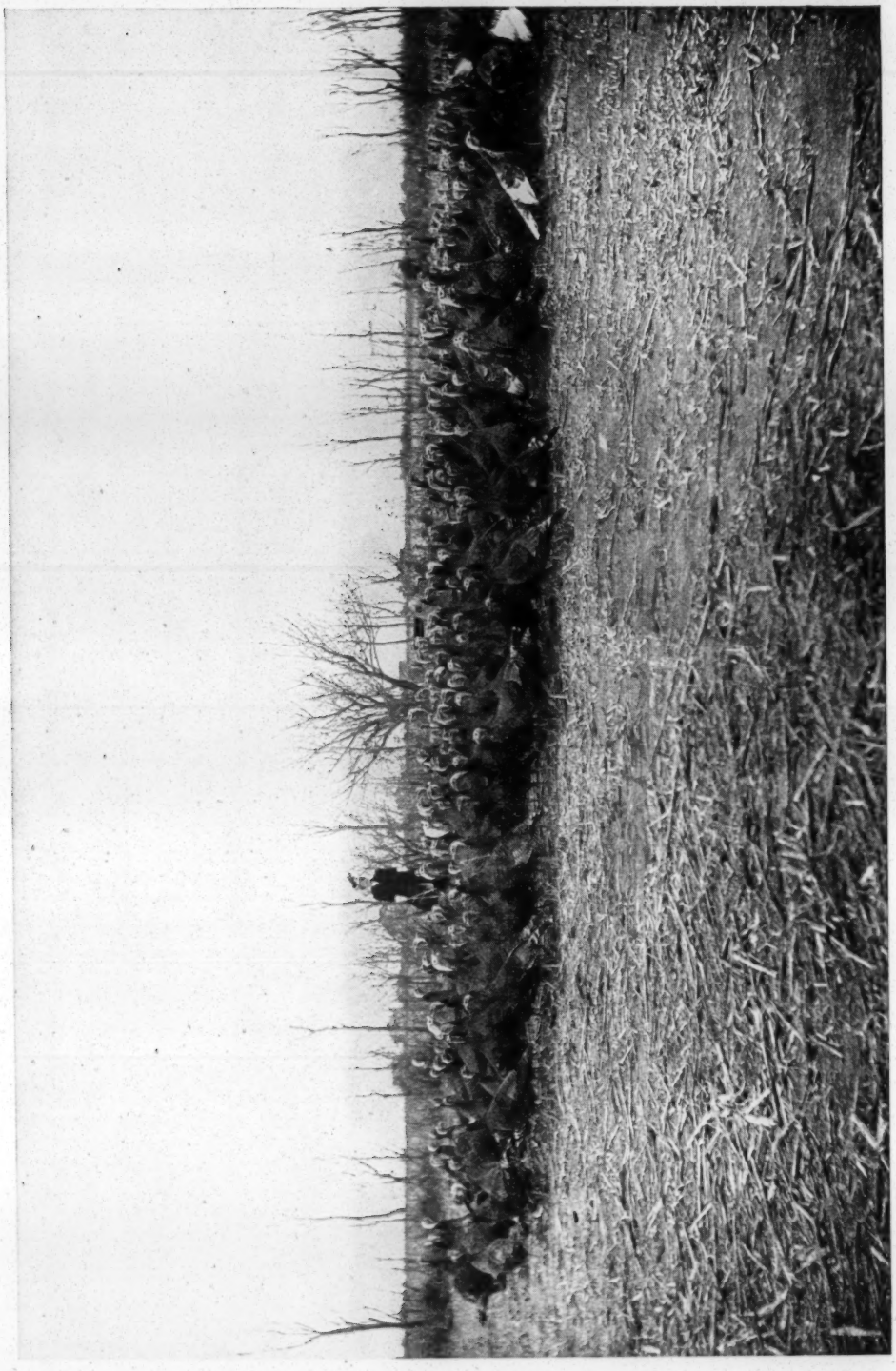
The farm unit has been fixed at 80 acres, and the building charge is $45 per acre. There is also an annual charge for operation and maintenance, which is 40 cents per acre at present. The watershed area is 12,000 square miles, and the estimated annual run-off of watershed at Pathfinder dam is 1,500,000 acre-feet.

TRUCKEE-CARSON PROJECT, NEVADA

This project is located in western Nevada, in Churchill, Lyon, and Storey counties, townships 16 to 24 north, ranges 21 to 31 east, Mount Diablo meridian. The first unit of the project was opened in 1907, and lands are now subject to homestead entry. In addition to the land-office filing fee, each settler is required to pay $3 per acre annually for



PUMPKINS IN AN ORCHARD: YAKIMA PROJECT, WASHINGTON (SEE PAGE 416)



SCENE ON A TURKEY FARM ON THE GARDEN CITY PROJECT, KANSAS (SEE PAGE 427)

A MILLET FIELD ON THE TRUCKEE-CARSON PROJECT, IN NEVADA (SEE PAGE 431)

ten years, without interest on deferred payments. An annual maintenance fee is charged in addition. The first payment of $3.60 per acre must be paid at the time of filing on the land; the farm unit is 80 acres.

The climate in this valley is healthful and mild, the elevation above sealevel is about 4,000 feet, and the temperature ranges from 12° below to 112° above zero. It is so dry, however, that the extremes, which seldom occur, are not severe. The average rainfall on the irrigable area is 4 inches per annum. The soil is sandy loam, clay loam, and volcanic ash, requiring 3 acre-feet of water per annum for each acre. The valley will produce every variety of crop grown in the north temperate zone; alfalfa, wheat, barley, and oats grow luxuriantly, and corn is also a profitable crop. Apples, pears, peaches, apricots, cherries, potatoes, and garden vegetables do well and find a ready market in the near-by mining towns. The Southern Pacific and Nevada and California railroads traverse the tract and furnish transportation to the markets of the country.

RIO GRANDE PROJECT, NEW MEXICO-TEXAS

This project contemplates the reclamation of 180,000 acres of land, 110,000 of which are in New Mexico, 45,000 in Texas, and 25,000 in Mexico.

The Leasburg dam, for the first unit of the Rio Grande project, is completed, diverting water for 20,000 acres in Mesilla Valley. It is of concrete, 600-feet long, with sluice and head gates. From the diversion dam 6 miles of canal were constructed to connect with the old Las Cruces Canal.

The Engle dam, which is planned to be constructed across the Rio Grande opposite Engle, will be of rubble concrete, gravity type, 255 feet high, 1,150 feet long on top, and will create a reservoir 200 feet deep at its lower end and 45 miles long, with a storage capacity of 2,000,000 acre-feet. Work has commenced at the dam site and will be prosecuted as rapidly as the state of the reclamation fund will permit. The valley has good railroad facilities, and contains many thriving towns, of which El Paso, Texas, is the metropolis.

The general elevation is 3,850 feet above sea level, and the temperature ranges from zero to 110° above. The average annual rainfall on the irrigable area is 9.5 inches. The soil is a fertile alluvium, requiring 2½ acre-feet of water per acre per annum. It produces abundant crops when sufficient water is applied, the principal products being alfalfa, corn, fruit, vegetables, and melons.

CARLSBAD PROJECT, NEW MEXICO

The principal works under the Carlsbad project include the reconstruction of canals and storage reservoirs on Pecos River, in Eddy County, which were built to irrigate about 20,000 acres of land. These lands are all in private ownership, but several thousand acres are included in excess holdings and may be purchased. The price of these lands varies from $20 to $60 per acre. The cost of water right is $31 per acre, payable in ten annual installments, and the annual maintenance and operation fee is 75 cents per acre.

The general elevation is 3,100 feet above sea level, and the temperature ranges from zero to 110° above. The soil is a light, sandy alluvium and very fertile. The principal crops in the valley are peaches, pears, apples, cherries, small fruits, alfalfa, cotton, sweet potatoes, celery, and garden truck. Fodder, corn, cane, and milo maize produce good crops. Stock-raising is very profitable, owing to the extensive range lands on the east and west. The Santa Fé Railway furnishes transportation facilities to near-by markets and to Denver and Chicago.

The watershed area is 22,000 square miles, the average annual rainfall on watershed area is 15 inches, and the estimated annual run-off, 150,000 acre-feet. The average annual rainfall on the irrigable area is 14 inches. The system is practically completed.

SHEEP ON THE TRUCKEE-CARSON PROJECT OF NEVADA, WHERE WAS DESERT COUNTRY BEFORE THE GOVERNMENT ENGINEERS CAME
(SEE PAGE 427)

HONDO PROJECT, NEW MEXICO

The Hondo project provides for the diversion and storage of the flood waters from Hondo River, a tributary of the Pecos, to irrigate 10,000 acres of land in Chaves County, near Roswell. The lands are all in private ownership, but excess holdings may be purchased at reasonable prices. The general elevation is 3,900 feet above sea level, and the temperature ranges from 10° below to 100° above zero. The soil is a fertile alluvium and requires 2½ acre-feet of water per acre per annum. Alfalfa, corn, fruits, and vegetables produce abundantly when properly watered. The Santa Fé Railway furnishes transportation facilities. The building charge is $28 per acre.

The watershed area is 1,037 square miles, the average annual rainfall on watershed is 15 inches, and the estimated annual run-off is 40,000 acre-feet.

PUMPING PROJECTS, NORTH DAKOTA

The government has several pumping projects in western North Dakota for the purpose of raising water from the Missouri River to irrigate bench lands which cannot be reached by feasible gravity systems. Steam and electric power are used for pumping, the power being developed from lignite coal, which is found in ample quantities adjacent to the projects. Two of these systems are already in operation, the Williston and the Buford-Trenton.

Williston Project.—The initial unit of this project includes about 8,000 acres of bench and valley lands surrounding Williston, but the system will be enlarged to cover 12,000 acres. The general elevation is 1,900 feet above sea-level; the temperature ranges from 59° below to 107° above zero. The soil of the bottom lands is a heavy clay, with a considerable quantity of alkali. The bench lands, however, are a rich, sandy loam, requiring 2 acre-feet of water per acre per annum. The principal crops grown are wheat, flax, and oats. The supply of oats is always far short of the demand. Alfalfa is profitably grown for winter feed, and sugar beets are likely to become an important crop. Small fruits do well if protected from the winds, and dairy farms and market gardens are needed. The state experiment farm near Williston is of great assistance in demonstrating the value and methods of irrigation to the farmers.

The main line of the Great Northern Railroad passes through Williston, which is the distributing point for this section of the state.

The Buford-Trenton project embraces the bench and bottom lands bordering the north bank of the Missouri River for about 20 miles east of the Montana-North Dakota state line. Power for the pumps on this project is developed at the main power station at Williston, and is transmitted electrically over a transmission line 28 miles long.

The climate and crop conditions are practically the same as those at Williston, and the building, operation, and maintenance charges are the same as under that project. The project embraces about 12,500 acres of bench and bottom lands on the Great Northern Railroad. Practically all the land is in private ownership, but farmers owning more than 160 acres are required to sell their excess holdings, and farms can be bought at from $15 to $25 per acre.

BELLE FOURCHE PROJECT, SOUTH DAKOTA

When completed this project will reclaim about 100,000 acres of land lying north and northeast of the Black Hills, in Butte and Meade counties, South Dakota. The greater part of this land has already been filed on. Water is now available for about 15,000 acres. There is a large amount of land in private ownership which, on account of the ruling limiting the individual water supply to 160 acres, is offered for sale at from $10 to $20 per acre, depending upon improvements and location. The farm unit on public lands is 40 and 80 acres. Settlers are required to pay a building charge of $30 per acre, and an annual fee of 40 cents per acre for operation and maintenance.

The average elevation is 2,800 feet above sea level. The climate is delightful, the temperature ranging from 25° below to 100° above zero. As in other parts of the arid region, the sensible temperature does not vary so much, owing to the dryness of the atmosphere. The soil is clay loam and sandy loam, exceedingly fertile and free from alkali. Fruits, such as apples, cherries, plums, and small fruits, do well, especially on the higher portions of the project near the bluffs, and potatoes can be raised on the south side of the river, where the soil is more sandy. The main crop, however, is alfalfa and native hay, which is in great demand for winter feed, the great number of cattle and sheep summer-pastured on the open range surrounding the project creating a constant demand for alfalfa. All the fruits and vegetables that can be raised on the project can be sold at the mining camps in the Black Hills. The Chicago and Northwestern Railroad passes through the town of Belle Fourche, which is one of the largest live-stock shipping points in the United States.

The engineering work on this project involves the construction of one of the largest earth embankments in the country, which is being built in a depression between two hills. It will be 115 feet high, 20 feet wide on top, and more than a mile long. The reservoir thus created will be filled with water by an inlet canal, which carries the entire flow of the Belle Fourche River.

STRAWBERRY VALLEY PROJECT, UTAH

This project provides for the irrigation of about 60,000 acres of land in Utah and Wasatch counties, on the eastern shore of Utah Lake. The water supply will be obtained from a storage reservoir that is being built in Strawberry Valley, about 30 miles east of the irrigable area. By means of a tunnel four miles long the stored waters will be carried through the mountains and emptied into Spanish Fork, from which a canal 18 to 20 miles long will convey them to the irrigable area. Power created from the high-line canal is now transmitted electrically to the tunnel for drilling and later will be utilized to pump water to lands above the gravity system.

The lands have an elevation of about 4,500 feet, and the temperature ranges from 18° below to 99° above zero. The soil is a sandy loam and gravel, with a deep black soil in the bottom lands, and is exceedingly fertile. Alfalfa, hay, cereals, sugar beets, fruits, and vegetables are grown. Settlers are getting ready to plant orchards as soon as water is available. The lands are all in private ownership, and existing canals are being enlarged to form part of the government system. It is possible to purchase lands at reasonable prices from present owners.

The watershed area is 200 square miles, the annual rainfall on watershed 18 inches, and the estimated annual run-off 65,600 acre-feet. This valley has one of the finest domestic water supplies in the west, artesian water being found at many points.

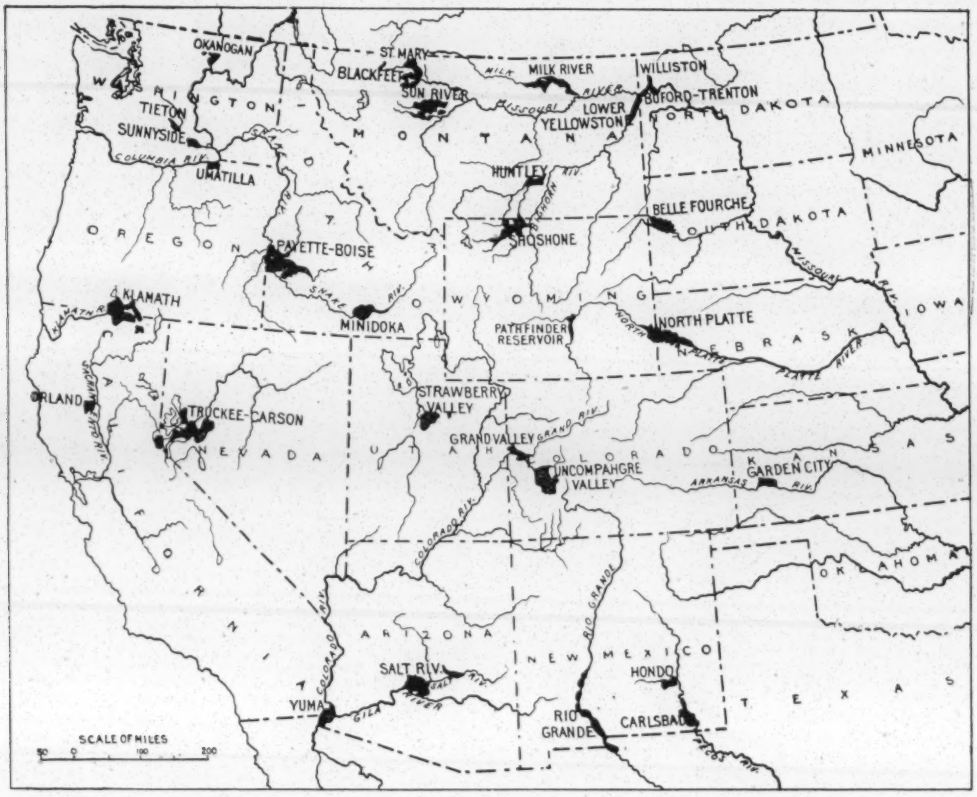
THE DEMOCRACY OF THE DESERT

The democracy of the irrigated sections always impresses the newcomer. It is due to the small farm, the independence of the owners, and the social equality of the people. Conditions compel association and organization in harvesting and marketing high-priced products. The narrow provincialism which has marked life where farms are large is not found here. Rural delivery of mails, with daily papers, the county telephone, traveling libraries, centralized schools, and trolley lines to the towns are all serving to bring the desert farmer within the stimulating currents of the world's thought. One of the most prominent farm editors in America recently said to me: "In the irrigated West there will be developed in time the most nearly ideal conditions of rural life and the best types of men and women the world has ever seen."

A summation of the work of the Reclamation Service up to January 1, 1909, shows that it has built more than 3,458 miles of canals and ditches, some of

K. VAN DER AARDE AND ONE OF HIS WINESAP APPLE TREES: YAKIMA PROJECT, WASHINGTON (SEE PAGE 416)

SEEDLESS SULTANA GRAPES GROWN BY IRRIGATION NEAR CARLSBAD, NEW MEXICO
(SEE PAGE 431)



OUTLINE MAP SHOWING THE LOCATION OF THE GOVERNMENT RECLAMATION PROJECTS

which carry whole rivers. Laid end to end, these canals would reach from New York to San Francisco. It has in operation more than 983 miles of telephone lines. It has built 338 miles of roads, most of which are in a country heretofore inaccessible. The tunnels excavated have a total length of more than 16 miles. Nearly one million acres are now ready for irrigation, embracing 4,686 farms. The construction works completed include 793 bridges and 7,297 canal structures, such as dams, headgates, turnouts, drops, etc.

The excavations of rock and earth moved amount to the enormous total of 54,889,977 cubic yards. It is estimated that as a result of the activities of this bureau more than 20,000 people are now established in homes in the arid West.

CAMPS AND CRUISES OF AN ORNITHOLOGIST

By George Shiras, 3rd

All the illustrations accompanying this article are from photographs by Mr Frank M. Chapman. They are copyrighted by D. Appleton & Co., publishers of "Camps and Cruises of an Ornithologist," from which they are republished by courtesy of Mr Chapman.

WHEN an experienced field naturalist of marked literary ability has mastered all the intricacies of modern photography, we have the best kind of a combination for the production of an attractive and reliable book on natural history. In a recent publication, bearing the above title, Mr Frank M. Chapman, Curator of Birds in the American Museum of Natural History, has embodied in detail his last eight years' ornithological expeditions on the North American continent, covering more than 65,000 miles of travel on land and water, and involving an immense amount of original investigation, aside from the collection of a series of bird photographs heretofore unequaled within the compass of a single volume.*

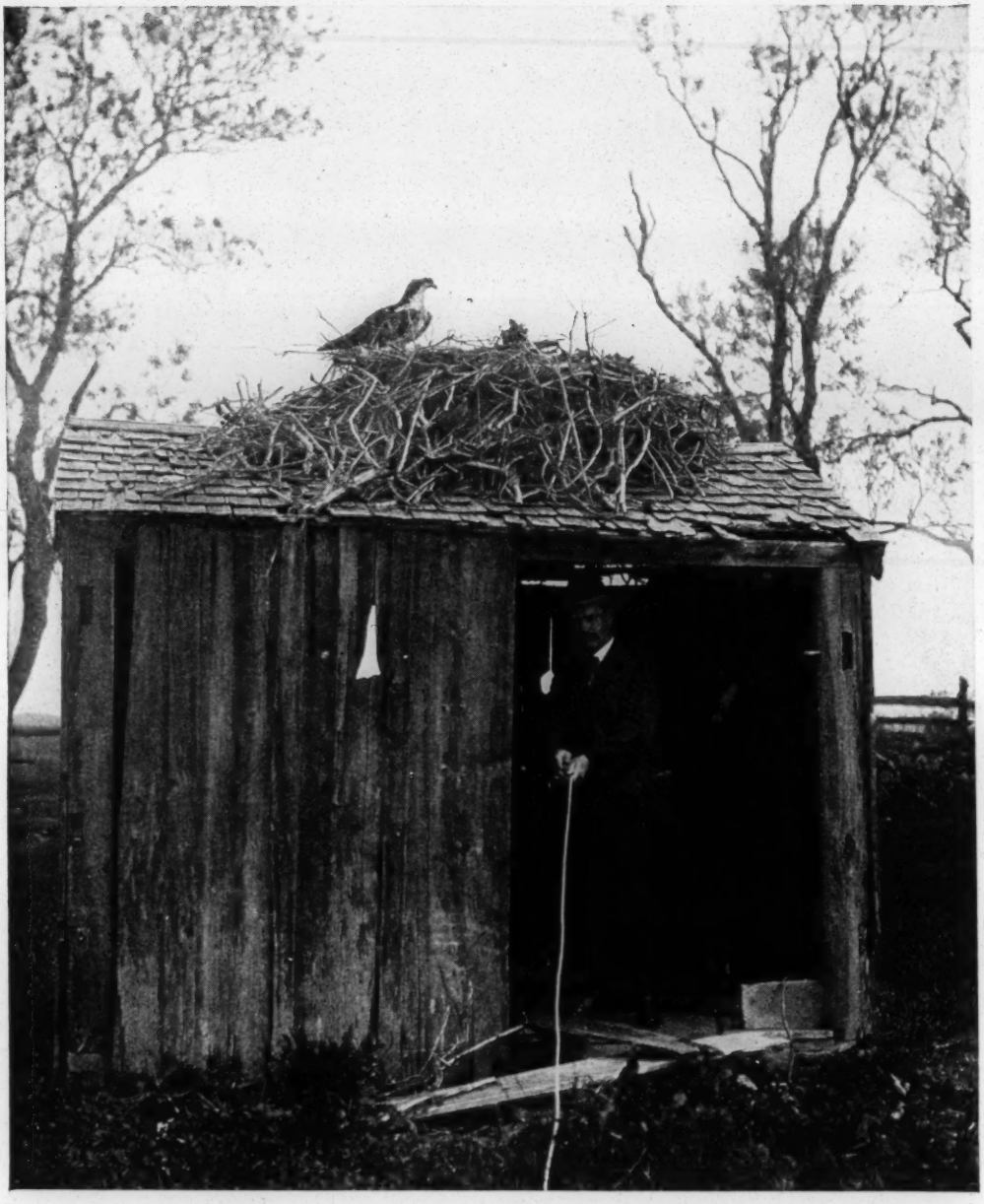
* Camps and Cruises of an Ornithologist. By Frank M. Chapman. With 250 photographs from nature. D. Appleton & Co., 1909. $3 *net.*

SAND RENDERED IN FEATHERS: A YOUNG BLACK SKIMMER ON COBB'S ISLAND

The hollow where the eggs are laid is not a chance depression, but is made by the bird—the female, so far as was observed—which, squatting close, turns round and round, actually boring out a shallow cavity in the easily yielding sand.

YOUNG FISH HAWKS ABOUT TO LEAVE THEIR NEST: GARDINER'S ISLAND, NEW YORK

YOUNG BLUEJAYS: ENGLEWOOD, NEW JERSEY



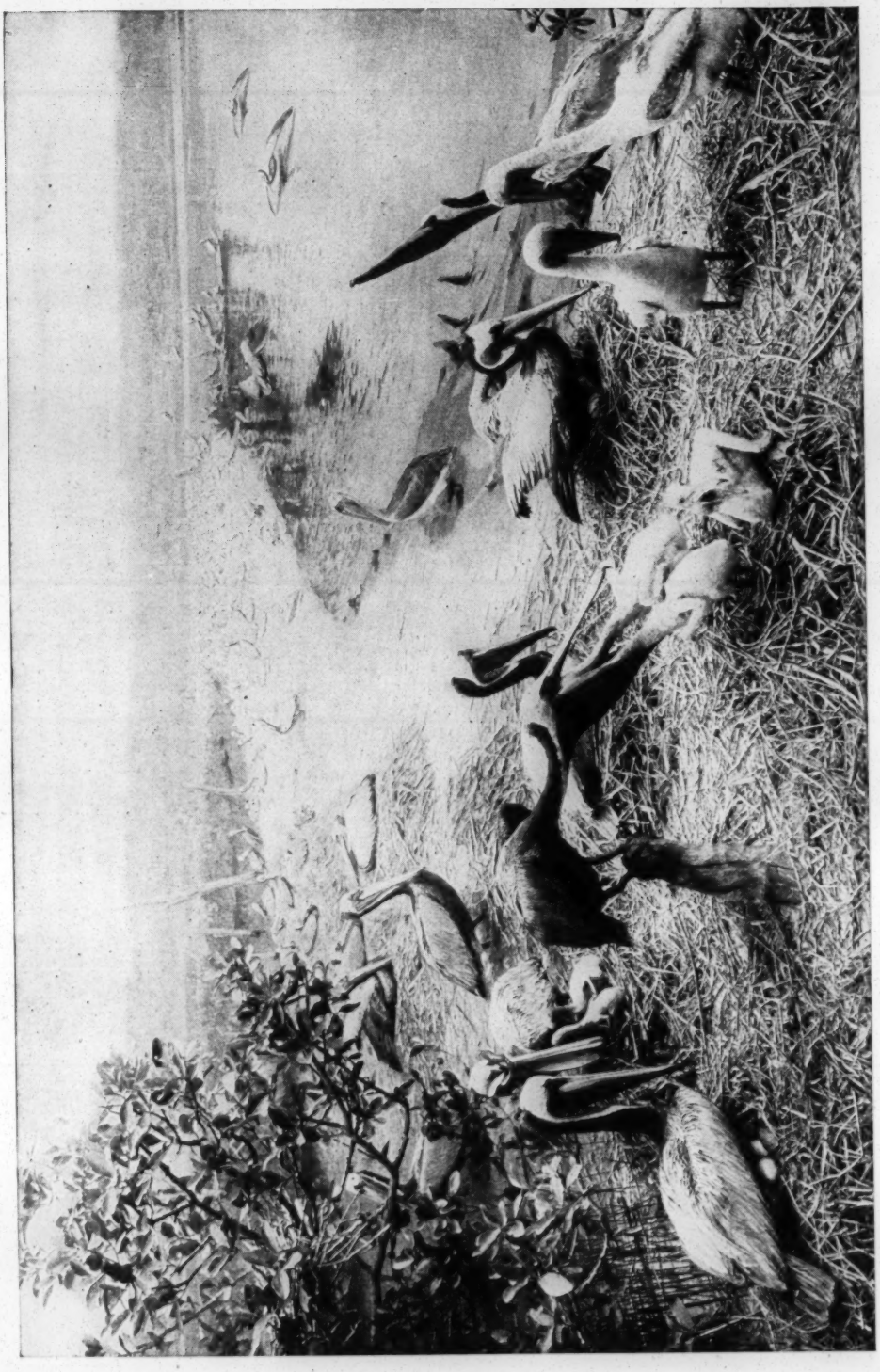
PHOTOGRAPHING A FISH HAWK, WHICH WITH ITS MATE HAD NESTED FOR MANY YEARS ON THE ROOF OF THIS "YOKE-HOUSE" ON GARDINER'S ISLAND

A camera was erected some forty feet away, and a rubber tubing, attached to a shutter, led to my hiding place in the basement of the fish hawk's dwelling. It required close attention to detect the sound of the bird's foot-fall on the floor above, but when assured of its return I could stand boldly in the doorway and, with the aid of a bicycle pump, make an exposure at my leisure.

FISH HAWK RETURNING TO ITS NEST ON THE SHORE, PHOTOGRAPHED FROM A BLIND 30 FEET AWAY

BROWN PELICANS ON PELICAN ISLAND, FLORIDA

"With a wing-spread of between seven and eight feet, a pelican is an impressive bird, even at a distance; but when dozens of the broad-pinioned birds swept by me within arm's length I realized that, given the excitable, courageous nature of terns and gulls, the pelicans might dispense with the services of a warden. It is true, a bird which had placed its nest on a stump six feet from my shelter snapped its bill loudly at me when I peered at her through a slit in my blind. The young defend themselves in a similar manner until their wings will bear them, when, like their seniors, they show their faith in the valorous discretion of flight."—FRANK M. CHAPMAN.



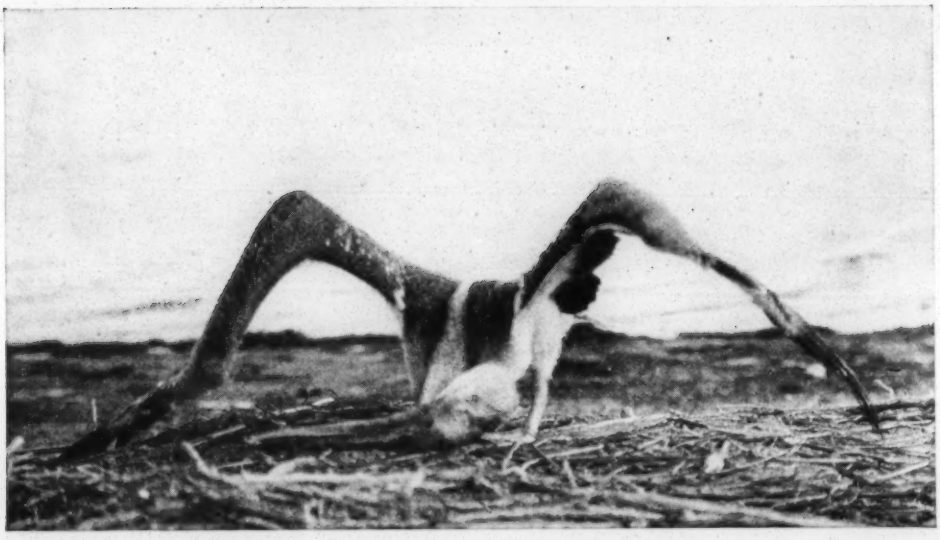
THE GROUP OF BROWN PELICANS IN THE AMERICAN MUSEUM OF NATURAL HISTORY, REPRESENTING PELICAN ISLAND, FLORIDA

THE PELICAN YAWN

THE UMBRELLA BLIND IN A MAN-O'-WAR BIRD ROOKERY ON CAY VERDE

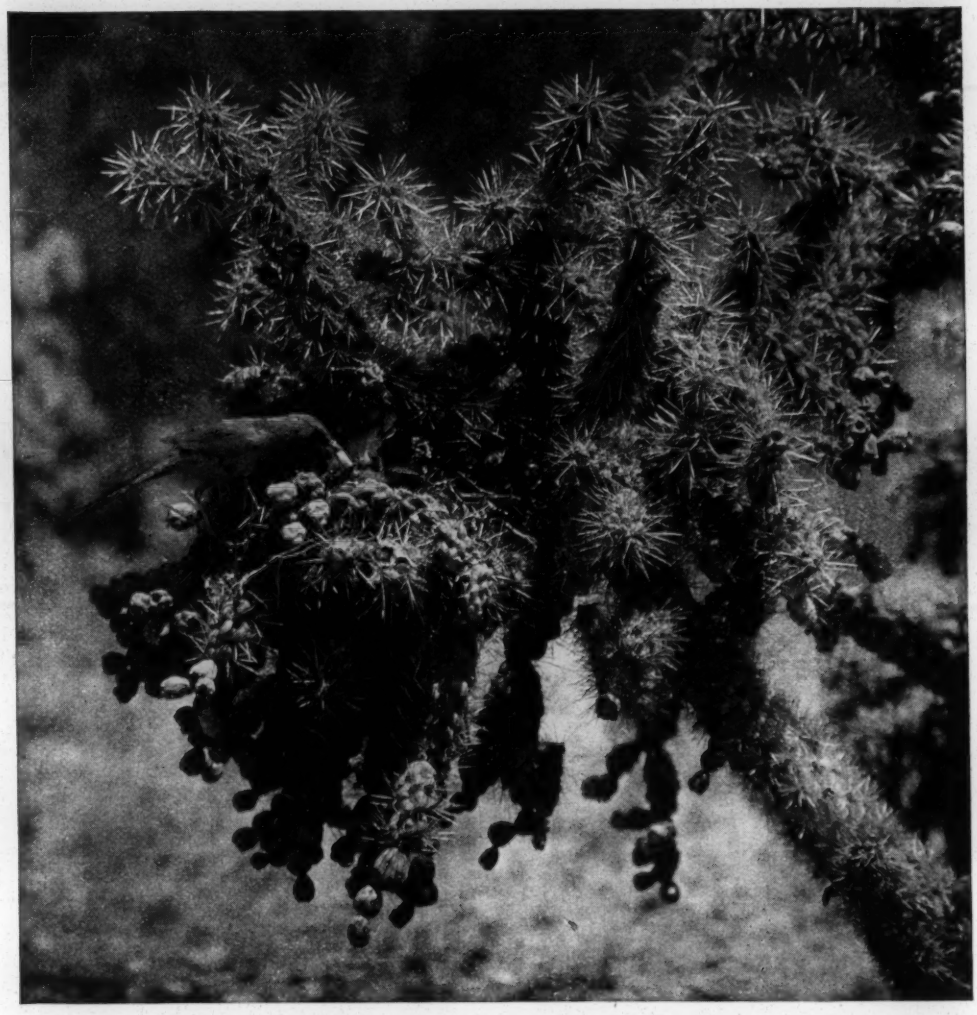
See description and photos of this remarkable colony, by George Shiras, 3rd, in June, 1908, NATIONAL GEOGRAPHIC MAGAZINE

BROWN PELICAN FEEDING A YOUNG BIRD LARGER THAN ITSELF



YOUNG BROWN PELICAN AFTER FEEDING

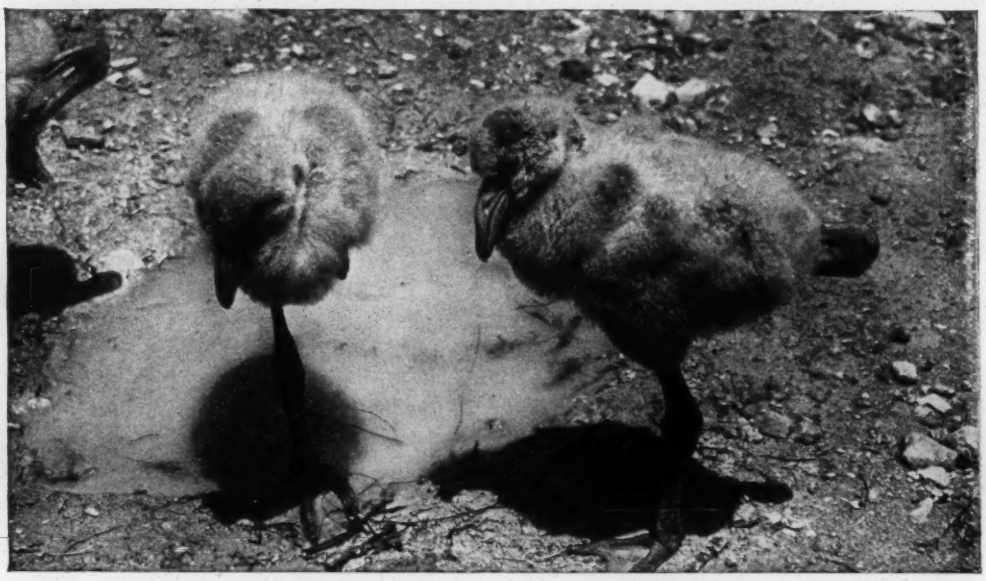
It lays its head on the ground as though it had received a violent blow



PALMER'S THRASHER AT NEST IN CHOLLA CACTUS: ARIZONA

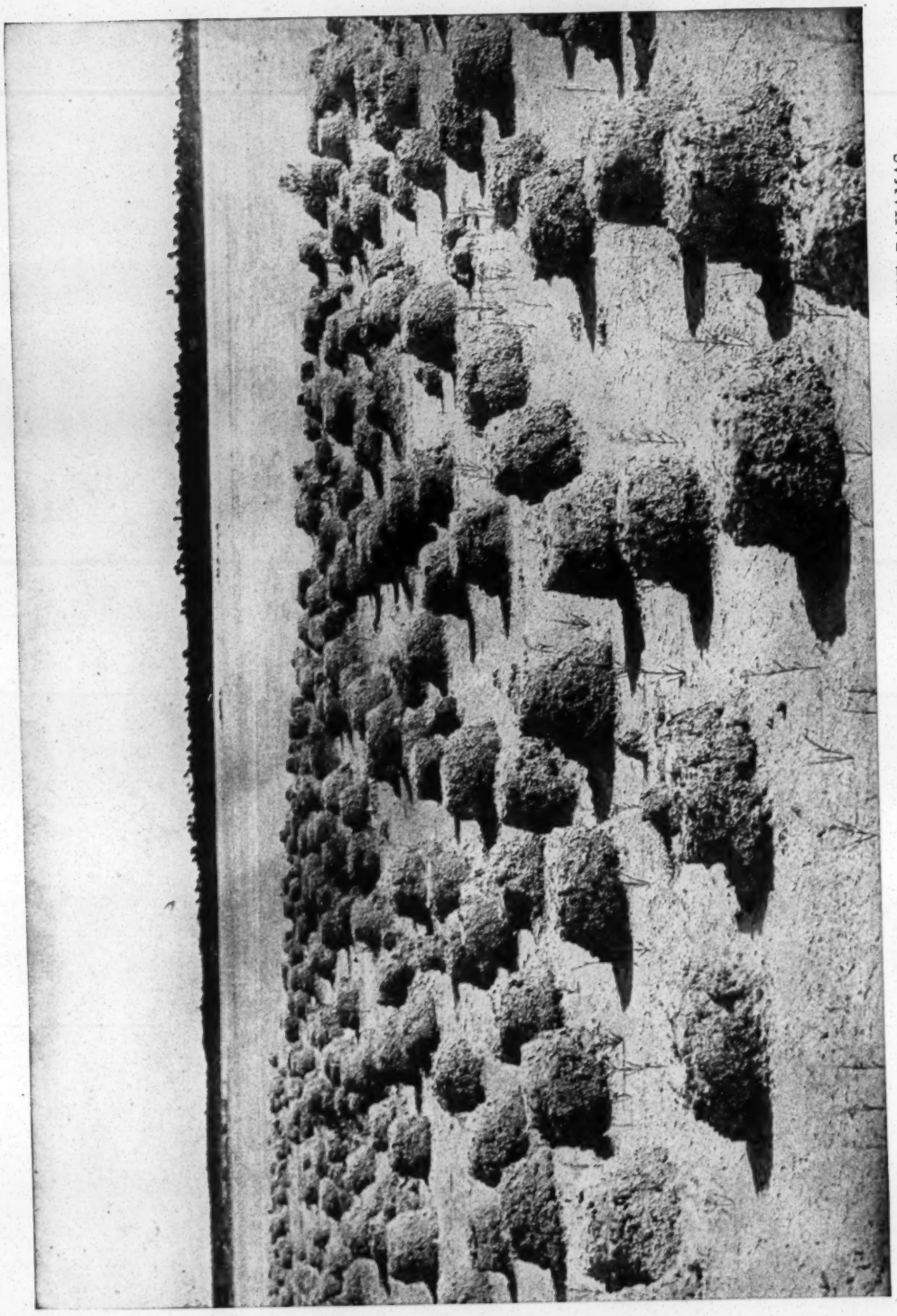
With the issuance of this book came the opening to public inspection of the completed Habitat Groups of North American Birds at the American Museum of Natural History, in New York. And these two events seem indissolubly connected, for it is beyond the limits of practicability to collect the material for such a book except in coöperation with the field work of some great museum, nor is it possible to appreciate the labors involved in the establishment of these remarkable Habitat Groups without reading the narrative of the many trips made to various portions of our continent in collecting the material.

While it may be true that the high degree of realism and artistic effect of this modern method of taxidermy can only be appreciated by a visit to the museum in question, yet one can get a very fair idea of the beauty of these groups from the half-tone reproductions in Mr Chapman's book, and, on the other hand, a life history of these birds can only be understood and appreciated through Mr



YOUNG FLAMINGOS ABOUT TWO WEEKS OLD: THE BILL SHOWS THE FIRST SIGNS OF CONVEXITY (SEE PAGE 450)

FLAMINGOS RETURNING TO THEIR NESTS



PORTION OF A DESERTED FLAMINGO CITY, CONTAINING ABOUT 2,000 NESTS: THE BAHAMAS

YOUNG FLAMINGOS IN FLOODED NEST

Showing the necessity of raising the nest above the normal water level

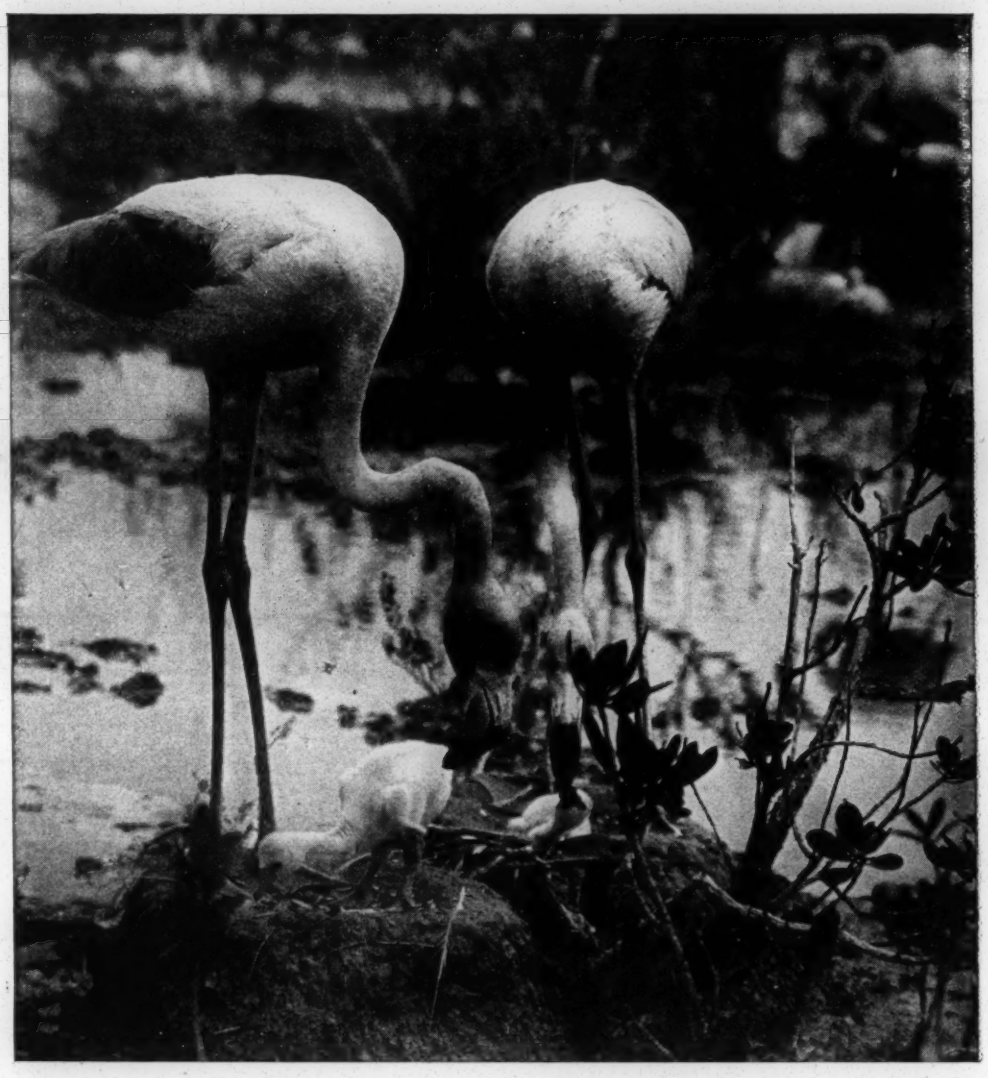
Chapman's vivid and interesting descriptions.

After reaching the desired locality, before securing specimens, the birds were first studied and photographed at short range from a specially constructed umbrella blind. This was often placed in the heart of the bird community, as with the flamingos and pelicans, or even in the tree tops, as with the egrets.

Mr Chapman's description of bird life begins with an account of some of the commoner birds familiar in suburban life; then the reader is taken to certain famous breeding islands on the middle Atlantic coast, where he pictures and describes the gulls, terns, skimmers, fish hawks, etc.; then comes several chapters on Florida bird life, with remarkable pictures and many original observations on the brown pelicans, water turkeys, egrets, white and blue herons, spoonbills, and birds of like character, followed by a chapter on Bahama bird life, where, after three seasons of arduous and dangerous voyages amid the hundreds of miles of scattered coral reefs and islands, he succeeded in getting the only photographic series of the beautiful pink flamingo, in the very midst of a vast breeding colony that had escaped the watchful eyes of the native spongers, supplementing this series with an equally valuable collection of photographs and specimens of man-o'-war birds and boobies secured on an isolated coral reef in the southerly part of the Bahama group and some 60 miles north of Cuba.*

From the West India waters we are

* Described by the writer in the June number, 1908, of the NATIONAL GEOGRAPHIC MAGAZINE.

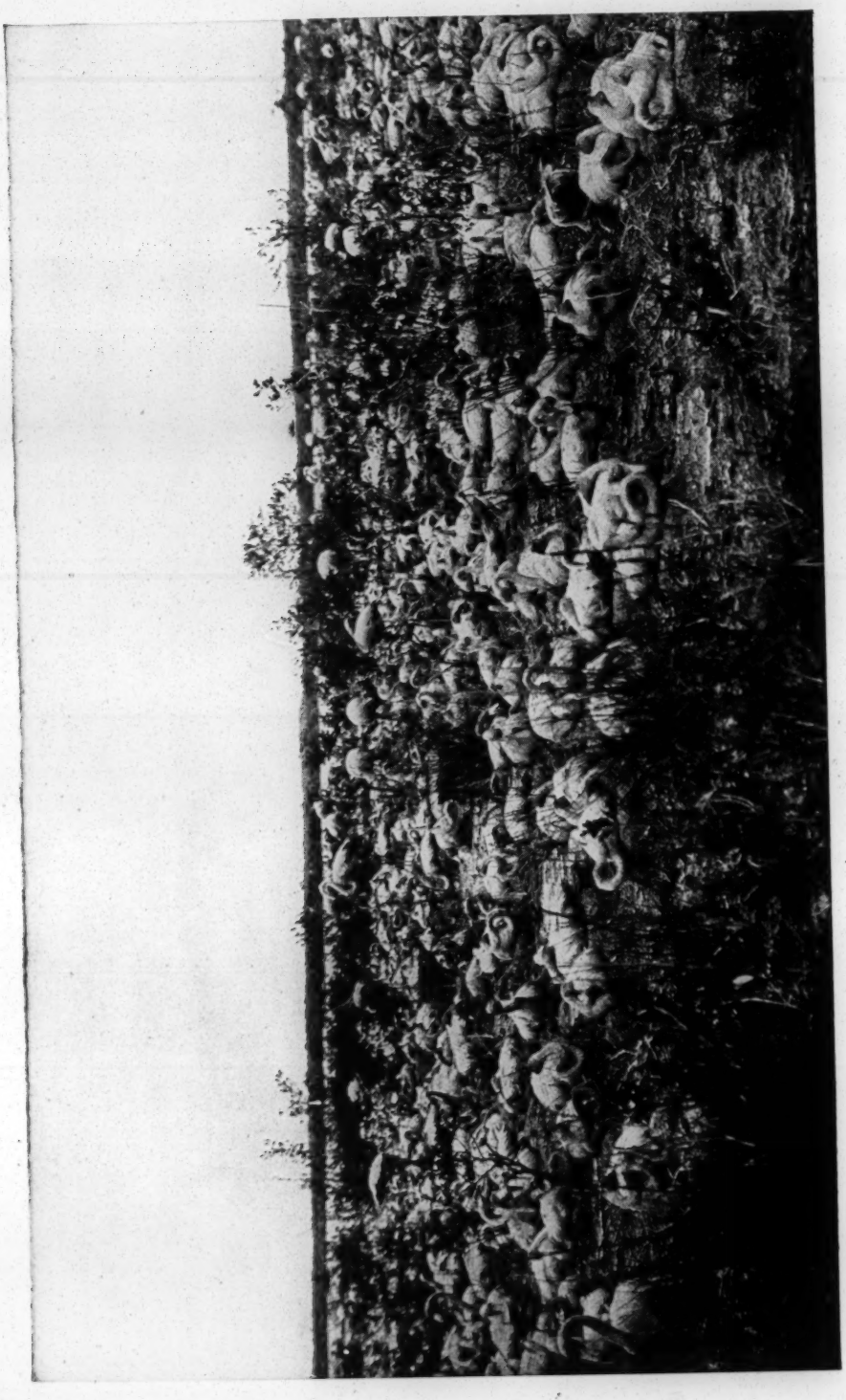


YOUNG FLAMINGO EATING SHELL OF THE EGG FROM WHICH IT WAS HATCHED

"The young stay in the nest until they are three or four days old. During this time they are brooded by the parents, one or the other of which is always in attendance. With a bill as large as their nestling's body, it was of special interest to observe how the latter would be fed. The operation is admirably shown on the opposite page. What in effect is regurgitated clam broth, is taken drop by drop from the tip of the parent's bill. This is the young bird's first meal. His next attempts at eating are of special interest. It will be observed that the bill in a newly hatched flamingo bears small resemblance to the singular, decurved organ of the adult. In the chick the bill is short and straight, with no hint of future curvature; and at this stage of its existence the bird feeds in a manner wholly unlike that employed by the old birds. It picks up its food. The second meal, then, consists of bits of the egg-shell whence the chick has lately emerged. When the bird is about three weeks old the bill first shows signs of convexity, and the bird now feeds after the singular manner of the adult, standing on its head, as it were, the maxilla, or upper half of the bill, being nearly parallel with the ground. Contrary to the rule among birds, the lower portion of the bill is immovable, but the upper portion, moving rapidly, forces little jets of water from each side of the base of the bill, washing out the sand and the mud through the strainers with which the sides of the bill are beset, and leaving the shells on which the bird subsists. Or, as Peter expressed it: 'It seems to me, sir, when de fillymingo feed dat de upper lip do all de wuk, sir, when he chomp, chomp, chomp, and grabble in de mud.'"—FRANK M. CHAPMAN.

FLAMINGOS FEEDING YOUNG

Note the straight bill of the young bird

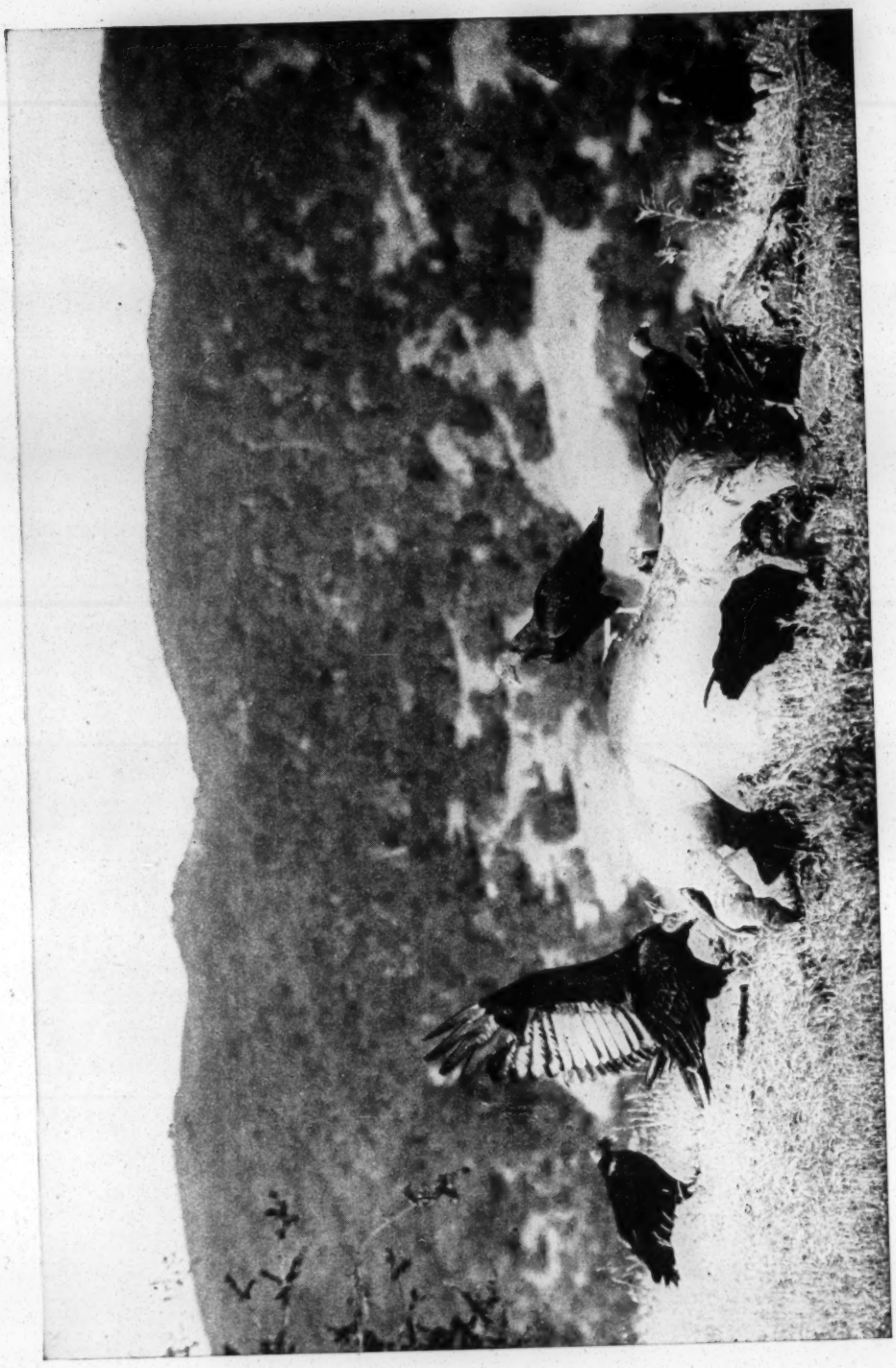


FLAMINGOS ASLEEP ON THEIR NESTS

FLAMINGOS STANDING GUARD OVER THEIR NESTS: EACH NEST CONTAINS ONLY ONE EGG

FLAMINGOS IN FLIGHT

"Flamingos in flight resemble no other bird known to me. With legs and neck fully outstretched, and the comparatively small wings set half way between bill and toes, they look as if they might fly backward or forward with equal ease. They progress more rapidly than a heron, and, when hurried, fly with a singular serpentine motion of the neck and body, as if they were crawling in the air."—FRANK M. CHAPMAN.



TURKEY VULTURES: CALIFORNIA

YOUNG LONG-BILLED CURLEWS: WESTERN CANADA

transported thousands of miles across the continent to the California-Oregon boundary line, where the shallow waters of Klamath Lake contain many islands of rushes and are surrounded by treeless plains, with Mount Shasta in the distance. Here were studied and pictured the cormorants and gulls, the Caspian tern, but, above all else, the white pelicans, immense birds with a wing expanse of from 8 to 9 feet, many of which are shown in flight or standing amidst a collection of rude nests containing eggs and young.

Another chapter takes us to the Canadian Rockies at Ptarmigan Lakes, where beautiful pictures were obtained of the white-tailed ptarmigan in summer plumage, some of them standing solitary and alone on pinnacles of detached rock

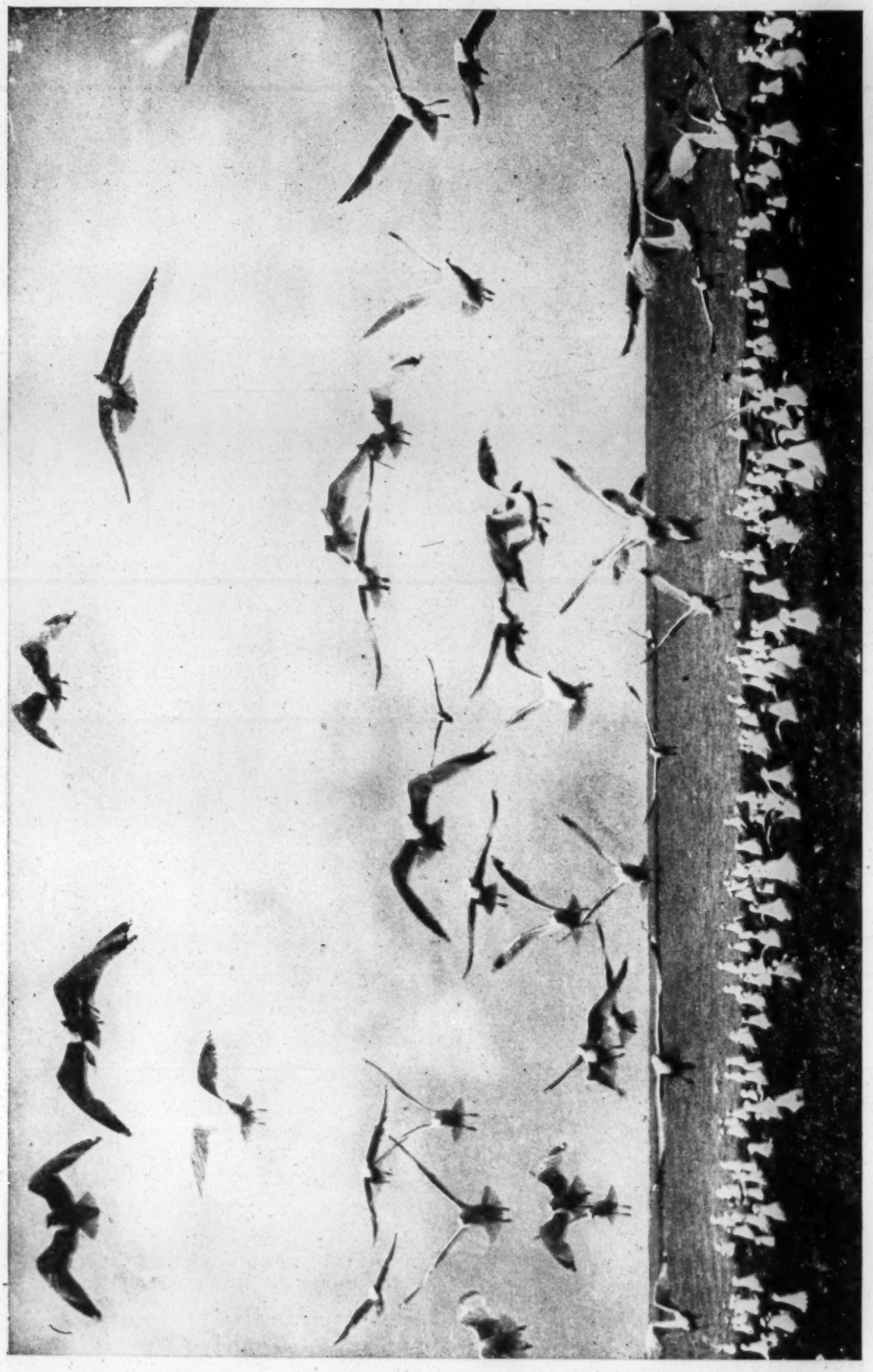
FEEDING YOUNG WILD GEESE: WESTERN CANADA

or seated upon the nest, as the camera pictured the scene. From here Mr Chapman went to the sage-brush plains of Wyoming, where he made a study of the sage-grouse, the largest of North American game birds, with the exception of the wild turkey.

Another trip was made to the rolling plains of western Canada, at Crane Lake, Saskatchewan, where the wild fowl were studied and a collection of specimens made for the Wild Goose and Grebe Groups.

Then a trip was made to the Pacific Coast, where, in consequence of the widely varying climatic and physiographic conditions, a wonderfully rich fauna exists; for among the birds there are over 500 species and subspecies in California alone, or nearly one-half the number known in all North America.

On this expedition Mr Chapman gives an account of his efforts to photograph the condor in the mountains near Piru and his experiences with the shore birds at Monterey, the Brandt's cormorants on the rocky islets of the coast, concluding with an account of California's most famous bird islands, the Farallones—which are not only the largest in the state, but in the Union—where he pictures and describes the murres, as they cluster by the thousand upon the rocky promontories, the air filled with thousands of western gulls, while, in smaller numbers, the guillemots and the tufted puffins were pictured on the inaccessible cliffs, with the great waves of an unfet-



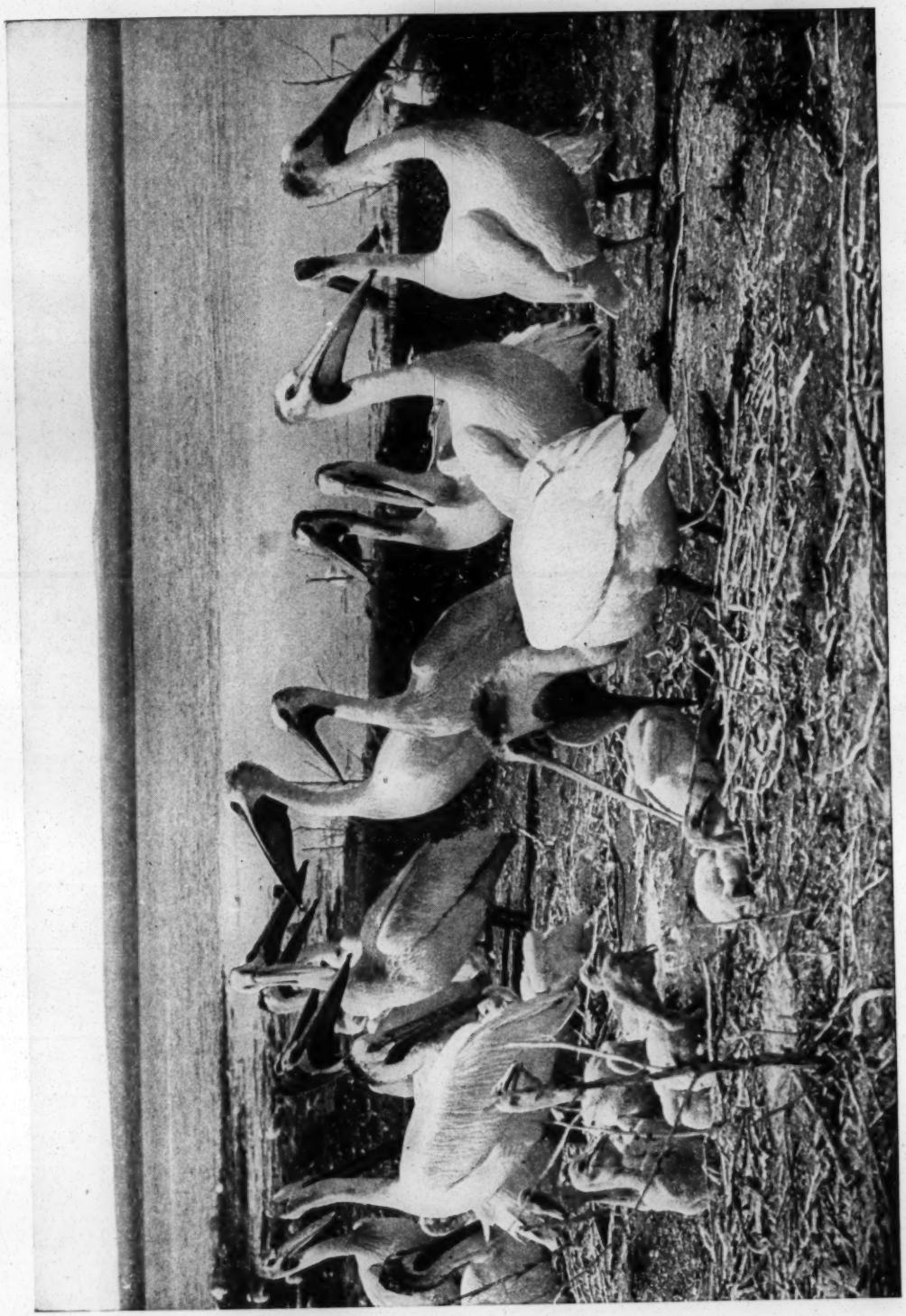
CALIFORNIA AND RING-BILLED GULLS: ON THE PLAINS OF WESTERN CANADA

CALIFORNIA AND RING-BILLED GULLS: WESTERN CANADA

"These birds were far from shy, and on being approached merely rose in the air, where, facing the wind, they hung suspended, all calling vociferously. So closely did their position depend on the direction of the wind that one could walk around the flock of clamorous birds, viewing first their heads, then their tails, without their attempting to face the cause of alarm."—FRANK M. CHAPMAN.

A COLONY OF SEVERAL THOUSAND WHITE PELICANS ON BIG STICK LAKE, SASKATCHEWAN

"We must also accord to pelicans that respectful attention which is due of extreme age. Pelicans became pelicans long before man became man, a study of the distribution of the eleven existing species leading to the conclusion that at least as late as the latter part of the Tertiary period, our white pelican, and doubtless also other species, presented much the same appearance that it does today. In many of the numberless lakes of Manitoba, Saskatchewan, and Alberta, invariably upon the islands, white pelicans nest; a colony containing anywhere from a dozen to several thousand birds."—FRANK M. CHAPMAN.



WHITE PELICAN FEEDING YOUNG

Note the knob on the bill of the bird in the background at the left. The knob disappears after the mating season

MURRES ON THE PINNACLES: FARNE ISLANDS

The birds are so closely crowded on the table-like tops of the Pinnacles that a newcomer finds a foothold with difficulty. Photographed across the gap from the main island. See next picture

THE PINNACLES: FARNE ISLANDS

Basaltic columns split from the main island, the summits of which form islands in the air for nesting murres

tered sea hurling themselves with terrific force against the base, sending the spray high in the air until it nearly reached the narrow ledges covered with a myriad of feathered inhabitants.

The book concludes with an interesting account of Mr Chapman's impressions of English bird life, made on the occasion of his visit to that country in the year 1907. Here he was especially interested in the native birds of the British Isles, the cuckoos, starlings, rooks, and the nightingale, and, above all else, in the great breeding colonies of murres, gannets, puffins, auks, eider ducks, and gulls inhabiting the smaller islands along the English coast, and which with camera and pen he pictures and describes most successfully.

This story of winged life upon the plains, the mountains, the lakes, and distant seas, mirrored faithfully with the lens and the truthful pen of a discerning naturalist, shows that, after all, truth is stranger than fiction, and that it is not necessary to distort and falsely color the biography of the wild in order to interest the human race in the ways and habits of avian life.

IN BEAUTIFUL DELECARLIA

By Lillian Gore

WHEN the word Dalarne is spoken in a Swede's hearing it awakens memories of the struggles of the daring Gustave Ericson, who as the founder of the Wasa line threw off the hated Danish yoke; it brings vividly before him the boldness of the loyal people of this region in rescuing the life of this patriot prince when to harbor him was a crime, and his heart glows with that patriotism on which the Dalecarlians first put the stamp of highest approval.

But it is not alone the romantic history of this beautiful province that charms the native Swede and fascinates the occasional tourist. It is also the varied scenery—mountain and dale, lake and river—the good people whose honest faces attract attention and command respect, and the primitive vocations and occupations of the contented folk that make the dale land of Sweden the very focal point of interest to all.

The climate is very much like that of Stockholm, and yet in passing out from the city's walls and exchanging the stolid houses and sombre streets for the free air of Dalarne, its limpid lakes, tumbling torrents, wooded heights, lofty mountains, deep recesses, one feels as though a month's journey had been taken and that the wheel of time had made countless backward turns. In these remote settlements, the home of quaint superstition and harmless witchcraft, there silently grew up a hardy race, made earnest by their struggle for existence and patriotic by the wooing nature demands before she yields enough to satisfy their simple wants.

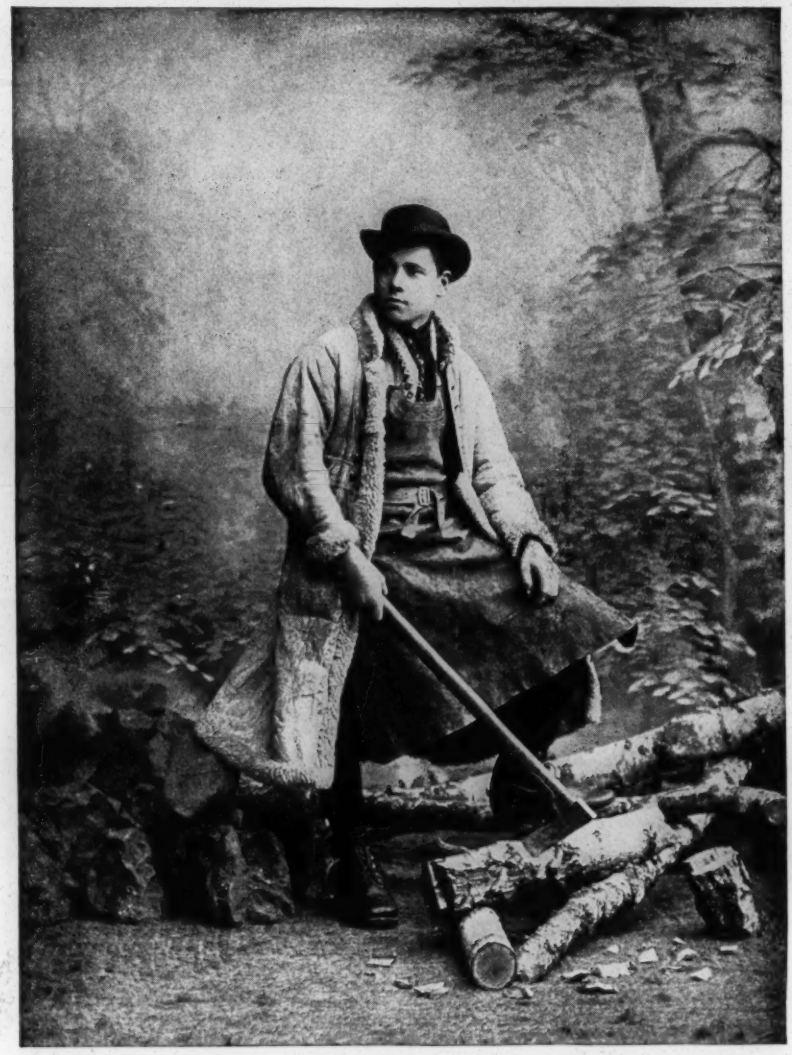
Their temperate and industrious lives enable them to pass patiently through the long winters, and when spring comes all hands, young and old, male and female, endeavor to make amends for the period of enforced idleness. Fortunately the long days help in this worthy endeavor. The children contribute their share by watching the cows, beginning as soon as they are able to toddle; when younger they rest in a sling on the mother's back as she goes to and from her work, knitting as she walks, or the sling, hung to a lower limb of a tree, is rocked by the gentle wind and the time quickly passes under the mother's watchful eye.

HOW SUNDAY IS SPENT

One's first impression of Dalecarlia is gathered at Mora Strand. Here the red houses cluster about the grand old church like chickens near the protecting mother-hen. No one can tell you the age of this edifice, though all know that its high steeple was added in 1673. For many years it lacked an organ, to the sorrow of the faithful, for no other church in the dale was in equal straits. Charles XV offered to make good this deficiency, but when he had to acknowledge that he could not furnish a performer who would last forever they declined his generous offer.

Leksand, too, can boast of its church, a colossal structure of Russian style capable of seating 5,000 persons. It had been predicted that upon the completion of the church the Noret would be destroyed by fire and the church itself be swallowed up by the lake. The people anxiously awaited the completion of this building which was to be their pride. Unfortunately the first part of the prophecy was verified, but the church still stands, and I trust it may long remain in the matchless beauty in which I last saw it.

In order to realize why such a large structure was erected here it should be borne in mind that the Swedes have for ages been intensely religious, and for a long time the church at Leksand was the only one for miles around. The people came thither from all directions, many



A BEAU OF LEKSAND IN HOLIDAY ATTIRE

"The men when at work wear for protection a leather apron, and when once put on they, believing that it would give them a cold should they dispense with it, wear the apron every day and Sunday, too."

walking ten and twelve miles in coming and going, while those living nearer the lake met at convenient points and went in their great church boats. For many years the coming of these boats upon the strand at Leksand was one of the sights of Dalarne. Although the number of church boats has decreased, the size has not suffered any diminution. Frequently they are as much as 30 or 40 feet in length and seat 70 or 80 persons.

The best time for strangers to get a glimpse of the people of Dalarne is on a Sunday morning, when the church services bring together the faithful from near and far. Many come from a distance in the two-wheeled gigs or in the great church boats. The children, too,

A LEKSAND BRIDAL COUPLE

MAKING LACE

will be there, and when they show signs of restlessness they are given an apple or a garlic, so that by the time the preacher reaches his "few words in conclusion" there is a decided odor of onions in the church. Since this is about the only time when the good people are assembled, every advantage is taken of the occasion, and a farmer who has a pig, calf, or colt to sell brings it with him, and as soon as the benediction is pronounced the would-be purchasers assemble about the proffered stock and discuss their defects instead of those of the sermon. While this use of the time and place may not be the best, it is more practical and less hurtful than the exchange of gossip so common in the more fashionable churches.

After service those who came from a distance may visit friends in the village or walk through the shady groves, but at a given hour they reassemble on the beach and start on the homeward journey. As they row up the lake, men and women bending rythmically over the oars, the bright hues of their costumes flash out like kaleidoscopic colors in the bright sunlight, and the hills echo the hymns they are singing.

ALMOST EVERY ARTICLE WORN IS MADE AT HOME

Home industry is practiced and almost every article worn is made at home. In Leksand the women's skirts are of black-homespun, with a gayly colored band about the waist. The same kind of skirts are worn both in the fields and at church, the only difference being that a newer one is selected for the latter occasion. An apron is ever present, the one for every-day wear is striped and of many colors, while a green apron is needed for some prayer days and a red one for others. The *ofverdel,* as it is called, shows only the sleeves. It is white and made of homespun linen, and is so carefully preserved that some see service for many years.

The one I have was made in 1854. Here the fondness for embroidery shows itself in decorating the sleeves near the shoulders and at the wrists. The bodice is of red material, also of homespun, made with narrow black strips, and a cap of the same goods for unmarried girls, while the married wear a cap of white, and for mourning a white square kerchief is laid over. Yellow is the color that rule prescribes for mourning, and for wedding nothing but blue will answer. In this last-named case the apron has for a trimming a narrow braid stitched across the bottom.

The wedding dress is further ornamented by the addition of a variety of ribbons and bits of finery not worn on ordinary occasions, together with a silk body more or less covered with embroidery. Around the neck is worn a bright-colored kerchief, which gives way on wedding and holidays to a kerchief of long ago, richly embroidered with black silk in cross-stitched pattern. On these occasions the old leather belt is brought forth and worn above the narrow belt of the skirt. This leather girdle, quite covered with pewter stars, is buckled in front, and on either side ribbons are looped on to designate brides and bridesmaids.

The children wear a dress of bright orange color, and while small and hardly able to support so much clothing of such variety, they are decked out with apron and kerchief like that of their older sisters, but with caps of a different shape. It is well that they are not the same, for to arrange the cap of a grown-up person requires no little skill.

The hair is divided into two parts. If long enough it is wrapped with white tape and the whole put in a coil around the head; if the hair is too short a flax twist or switch is made use of for a similar purpose to round out the head into its proper shape. Over the foundation thus laid the cap is tightly drawn down over the ears. It is very comfortable, if properly put on, and in winter it helps to keep the ears warm.

FARMING UNDER DIFFICULTIES

In the country districts of Sweden the women assist the men in the farm work,

and in going out to their daily tasks the bright colors of their costumes blend harmoniously with the green grass and rich foliage.

They do not make the plea that, being the weaker sex, they should have the lighter work. Even if the men swing the scythes, the women deftly toss the new-mown hay in the sun and hang it upon racks to dry. The men when at work wear for protection a leather apron, and when once put on they, believing that it would give them a cold should they dispense with it, wear the apron every day and Sunday, too. However, when Sunday demands the long "church coat," the leather badge of work is laid aside for the day.

Because of the insufficient supply of warm sunshine in this high latitude it is necessary to hang the cut grain upon racks to ripen. When properly cured it is hauled to the barns upon two-wheeled carts, there to rest until a lull in the general work permits the annual threshing. This labor calls into service the entire force of the farm—men, women, and children—some to pass the sheaves, one to feed the machine, another to pitch the straw, and others to take care of the grain, while I won the everlasting gratitude of my farmer host by driving one of the horses on this important occasion.

The farms are usually small, for the owner upon dying divides it in equal shares among his children, and these shares after repeated subdivisions become mere patches. Sometimes one may buy out his brother, or he may secure possession of one or more distinct parcels and thus own a number of disconnected pieces. My host was the owner of 26 such tracts, some exceedingly small and so narrow in fact that a horse and wagon could not be turned around upon one of them, and others were several miles from his home.

Many farmers have back from the lake in the hill country pasture land or ground too rough or too remote for cultivation. Here the stock, and especially the cows, are kept during the summer months. In this distant retreat one or more members of the family remain to look after the cows, make butter and cheese, pack away a supply for winter use, and cure such hay as may not be needed for the grazing cows.

The flax, which in its finished state forms such an important part of the dress of men as well as women, and used so extensively in making the bed and table linen, is raised on many farms. At one time every farmer had his patch of flax, but now the manufactured goods are crowding out the home-made and only the old-fashioned folks, who will not be satisfied with anything but the best, still hold fast to the products of their own looms.

The lace also, which plays such an important rôle in ornamenting the fancy kerchiefs and head-dresses, is a home industry. Each parish has its own patterns of lace, and the expert in one pattern has no temptation to learn a new one, but goes on perfecting herself in the pattern of her own parish.

The houses of the farmer class are very simple, made in many cases of rough, unhewn logs, with the cracks filled up with the moss which grows in such abundance here. In one corner of the room are two stationary beds, one above the other, in another corner the great open fireplace, and benches are about the walls. A plain table, wooden bowls and spoons, and a corner cupboard, in which the household treasures are stored, complete the furnishing of the average home. A narrow shelf over the window is the place of honor for the Bible and the book of Psalms, and near by is suspended the long pole on which is strung the loaves of ring-like rye bread to dry. This bread apparently never grows stale, but is always just to the farmer's taste.

Here, as elsewhere in Sweden, coffee is all-important. The first thing in the morning is coffee with "dip"—that is, a bread of finer texture baked especially for this purpose; then at 9 o'clock breakfast, a rather substantial meal with potatoes, fish cooked on glowing coals, and frequently a kind of gruel for those who

IN THEIR SUNDAY ATTIRE

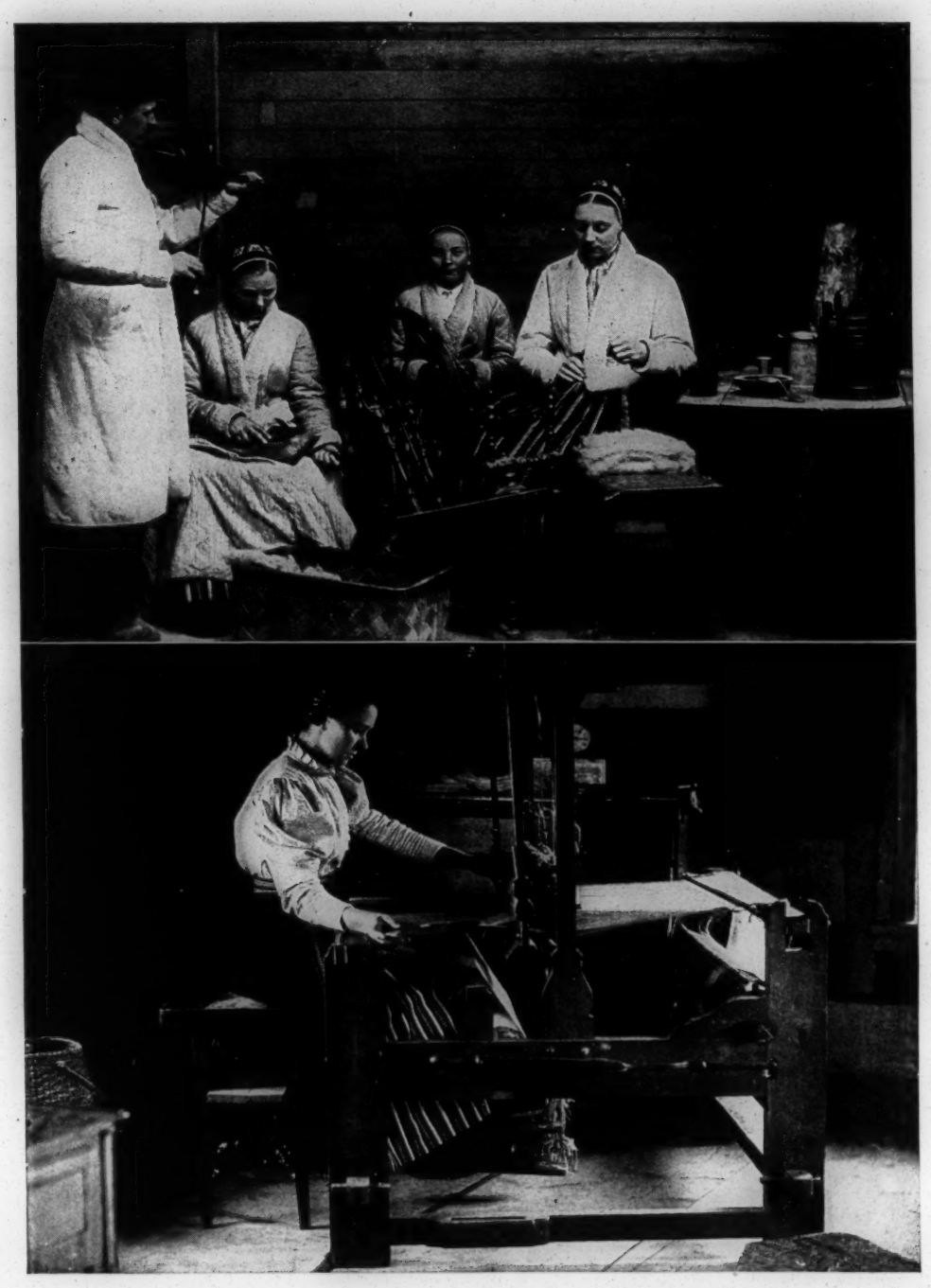
are specially fond of milk. In about two hours all hands are ready for more coffee, and this stays them until they stop for dinner at 1 or 2. This resembles breakfast with the occasional addition of meat, and the frequent appearance of "Svagdricka"—a weak drink. This national beverage is made of hops, and although it quickly becomes sour, it is always held in high esteem. The afternoon work is broken at 4 for more coffee, and if the laborers are in the field some one stops long enough to fetch it.

I have often had the pleasure of joining the happy group, sitting with them on the ground and enjoying for a while their merry chat and well-earned rest. In Dalarne it is customary to pour enough into the cups to completely fill it and at least half the saucer, for anything less than that would betoken stinginess—an accusation most hateful to these generous people. When the day's work is done and the tools put away, all sit down to "gröt och mjölk," a kind of porridge of rye-flour and water. This dish would hardly be palatable to an American, but to the Swede it has a natural taste. When cooked it is put in a big earthen dish in the middle of the table so as to be in reach of all. Each one being provided with a bowlful helps himself to milk, and taking up the porridge, a spoonful at a time, dips it into the milk and eats, the operation being continued until hunger is satisfied.

Nothing is more enjoyable than the farm life here. The people in their natural simplicity are a continual source of interest, their honesty is proverbial even in Sweden, and they place such a high estimate upon truth that they never suspect falsehood nor deception.

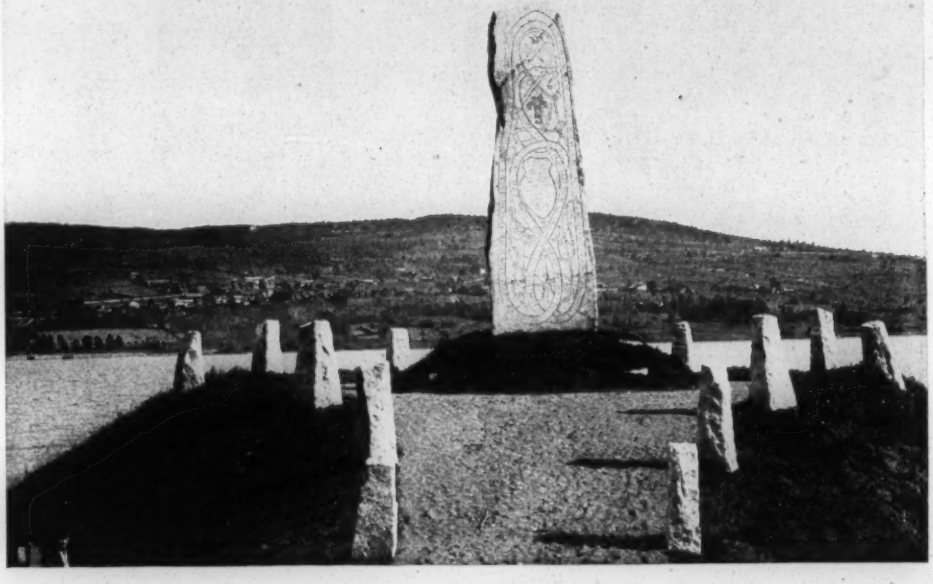
PICTURESQUE ORSA

The most interesting, but the least known of the parishes of Dalecarlia, is Orsa. It is the least known because

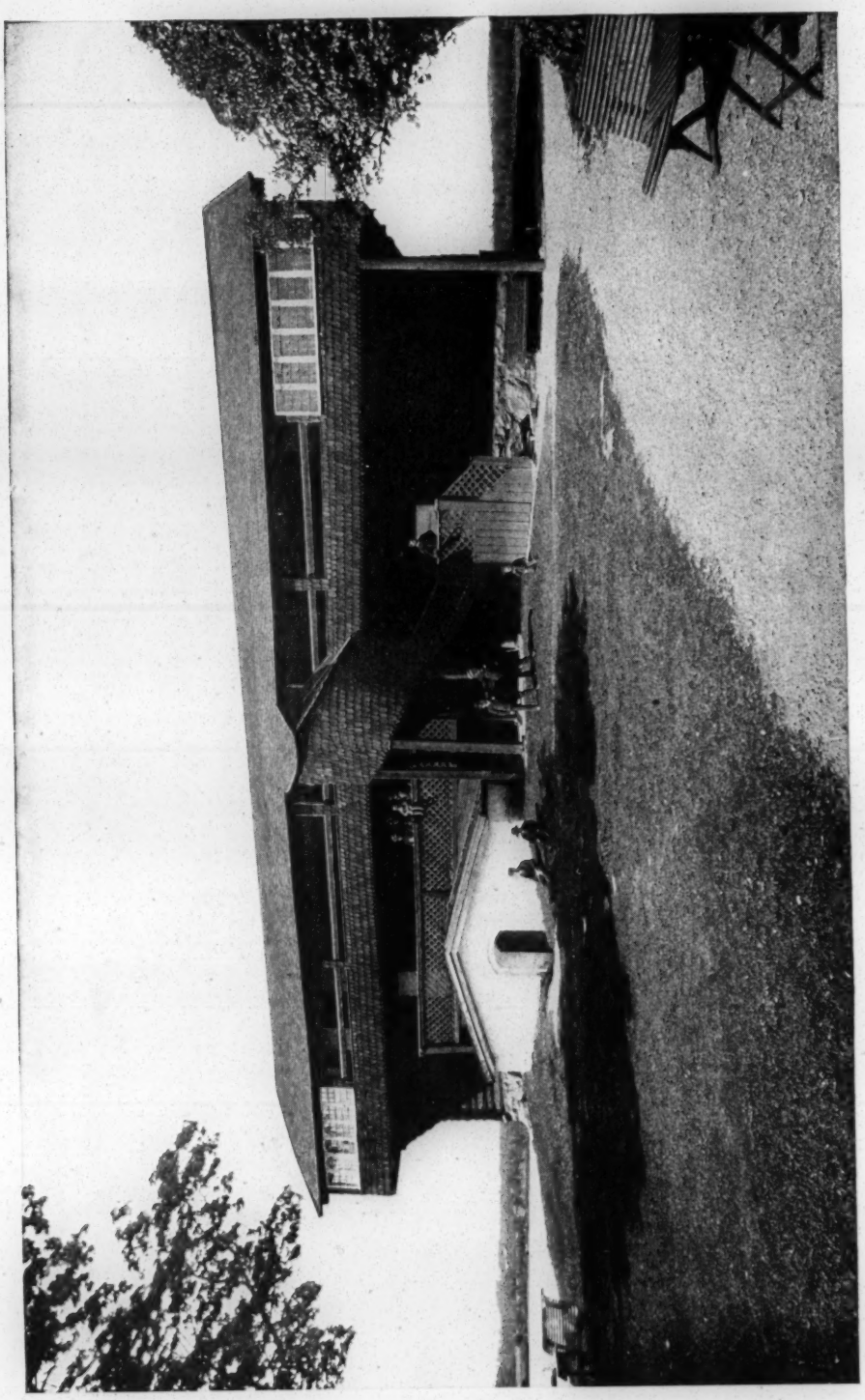


CARDING, SPINNING AND WEAVING IN A SWEDISH HOME

A FARMING SCENE



A WASA MONUMENT AT RÄTTWIK



THE ORNÄSSTUGAN, OLD BUILDING IN DALARNE

tourists visiting this center of Sweden's many attractions usually think they have seen all when Leksand and Rättwik have been thoroughly inspected. And then until recently the means for penetrating thus far into the Scandinavian Peninsula were not at all attractive. Now one has quite a choice of routes: a railroad connects Rättwik and Orsa, and during the summer a comfortable boat plies between the places named, while a good road leads directly from Leksand to Orsa, 45 miles distant, over which the cyclist can wheel or the leisurely inclined traveler may be carried in a hired conveyance.

This parish is noted for its strong, handsome people, and the thrift and industry of old and young are proverbial. The women here, as in all the rural districts of Sweden, assist the men in the farm work, but when winter comes to call the men away to the woods or to the grindstone quarries, they are left at home to look after the house and farm, children, and cattle. In other days, as we learn from song and saga, the long winters of enforced idleness rested heavily upon the inhabitants of Orsa, and many times before spring broke the icy barriers against the supplies coming from the south it was necessary to eke out the stock of flour by mixing with it pulverized bark. But now the scarcity of timber in the more accessible districts has sent lumbermen here to make the hillsides yield their harvest and every one is deriving therefrom immediate if not ultimate profit. To such an extent is this true that we find here a parish so rich from the revenues of its own lands, that all property is exempt from taxation.

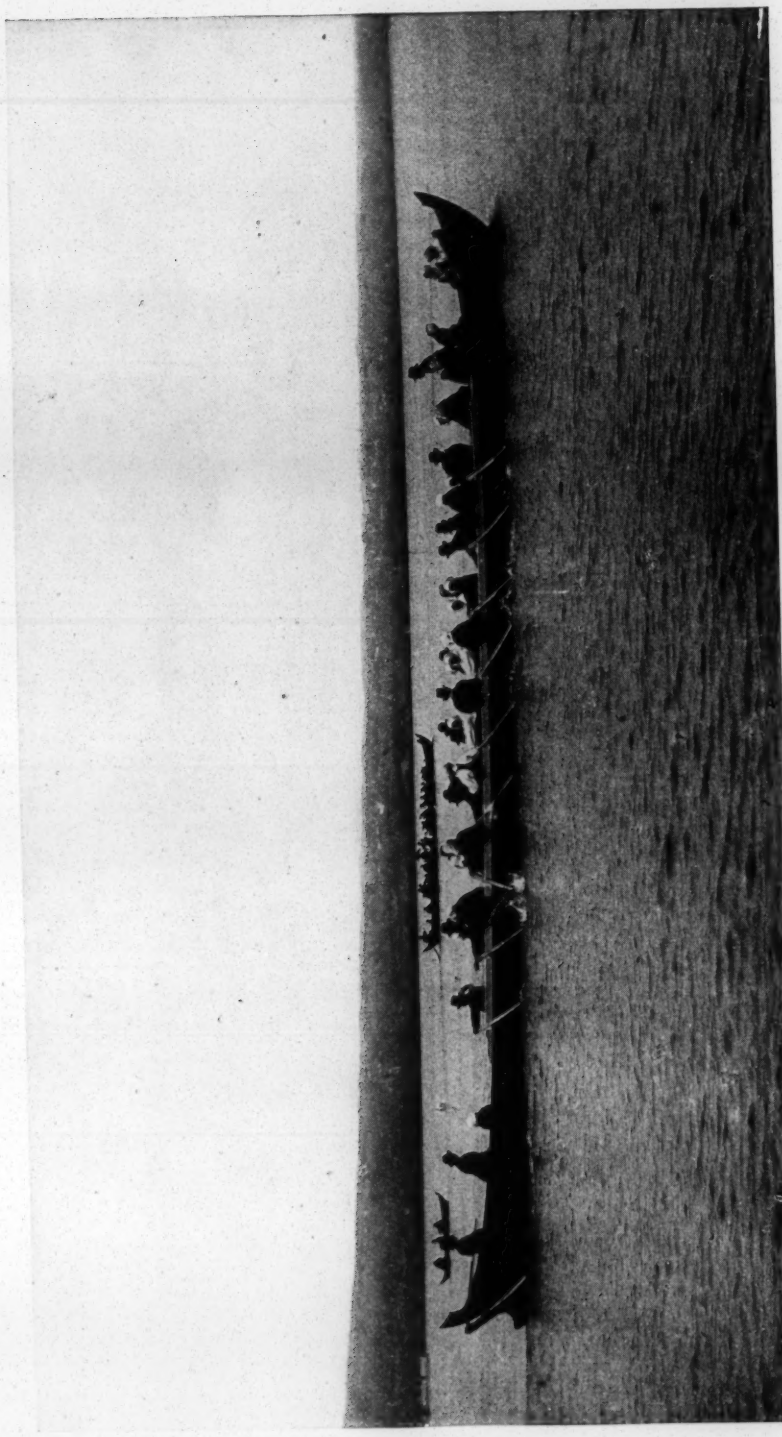
The language of these hardy mountaineers is unlike that of their nearest neighbors, and it is with difficulty that mutual conversation is carried on when they meet. However, intercourse is so rapidly eliminating these linguistic differences that an interpreter is not needed, as was said to be the case a generation ago.

I have visited Orsa on various occasions, usually, however, during the busy summer season, when every effort was being put forth to secure as much food and fuel as possible for winter use, but on my last trip to the Daleland a fair furnished the opportunity of seeing them in their holiday attire, with all thoughts of work and winter out of their minds. It was a joyous sight. Old as well as young were enjoying the well-earned rest, and finery but seldom seen was on this day getting a good airing. The stranger was welcome, especially when my Dale dress showed that curiosity had not prompted the visit.

After watching their games for some time I thought it a good time to drop in at a few of the country houses to gather from such of the old folks as might have staid at home some of their folk-lore. But after driving from place to place, into by-ways, and up the mountainsides without finding any one at home, we were forced to the conclusion that everybody was at the fair. And why shouldn't they be? The summers are short at best and the long winters, with their dreary nights keeping the families closely housed, afford no opportunity for fun or merry-making. An important feature of this fair was its bazaar, where each person could offer for sale such articles as they wished to dispose of. Here were seen in abundance caps and mittens, robes and blankets, and numerous articles made of that tightly woven, undyed woolen goods, known as wadmall, which stood Nansen in such good stead during his stay in the far north.

IN THE LUMBER CAMPS

With the approach of winter the men leave home for the ever-receding lumber camps, where biting winds and heavy work will be their portion as long as the snows lie on the ground to slick the roads over which the logs are drawn. The camps are simply log huts, not so well built as the cosy houses they left, and the great fire built in the middle of the room does little more than keep warm the feet of the men as they lie about it. This fire must be kept up all night, so the men take turns as firemen, while



ROWING TO CHURCH IN DALARNE (SEE PAGE 465)

HANGING THE NEW-MOWN HAY ON RACKS TO DRY

OLD AND YOUNG CITIZENS OF DELECARLIA

others must every now and then give the horses some exercise to keep them from freezing.

The logs are drawn on sleds to the banks of the streams, there to rest until spring comes, when they are floated down by the rushing waters coming from the melting snows. This is the most dangerous part of the work. At all points where the logs might become wedged in between opposite banks, or where a sharp turn in the stream would cause the logs to be thrown upon the shore, there men must be stationed who with long poles try to keep the logs in the channel, and that, too, without delay, for hundreds and thousands are hurrying down, and if two or three should become fastened there would be a jam which might require weeks of work to loosen. In this labor men are frequently knocked into the current and drowned before the eyes of their comrades.

Equally laborious, though less exposed, is the work in the porphyry beds at Elfdahl, where a large number of men find employment during the winter months. This industry, first developed to afford relief from a famine that threatened Orsa in 1788, has been a continual source of profit to its promoters. One of the finest objects ever cut here is the gigantic vase made from a single piece of stone and measuring 9 feet in height and 12 feet in diameter that now stands in the deer park at Stockholm. It was in one sense a votive offering made by the people to their king, Charles XIV, who as owner of the quarries did so much towards their development, chiefly as affording work for the men of this section, and now his remains rest in a sarcophagus of porphyry from these self-same quarries.

Near Falun, the great mining district of Dalarne, lies Lake Runn, on whose bank rests the famous Ornasstugan, or cottage of Ornas. It is not only a splendid example of the architecture of two centuries ago, but it is one of the cherished monuments to the wonderful escapes of Gustave Wasa. The building belongs to the state, and in the room which was occupied by the great liberator during his short stay here, we find an interesting museum.

If you wander for days throughout this land the eyes will ever see something new, and the ears he daily gladdened by the recital of the legends of long ago or the quaint myths of today. Monuments on every hand tell of the loyalty of the early heroes, and strong arms and earnest faces plainly show that their beloved king would not be obliged to call long nor loud for loyal defenders.

There forests rule in gloomy grandeur,
There rivers break 'gainst rock and shore:
A glorious land! Yes, honest Daleman,
Which none can see to see no more.

MAKING FLAX

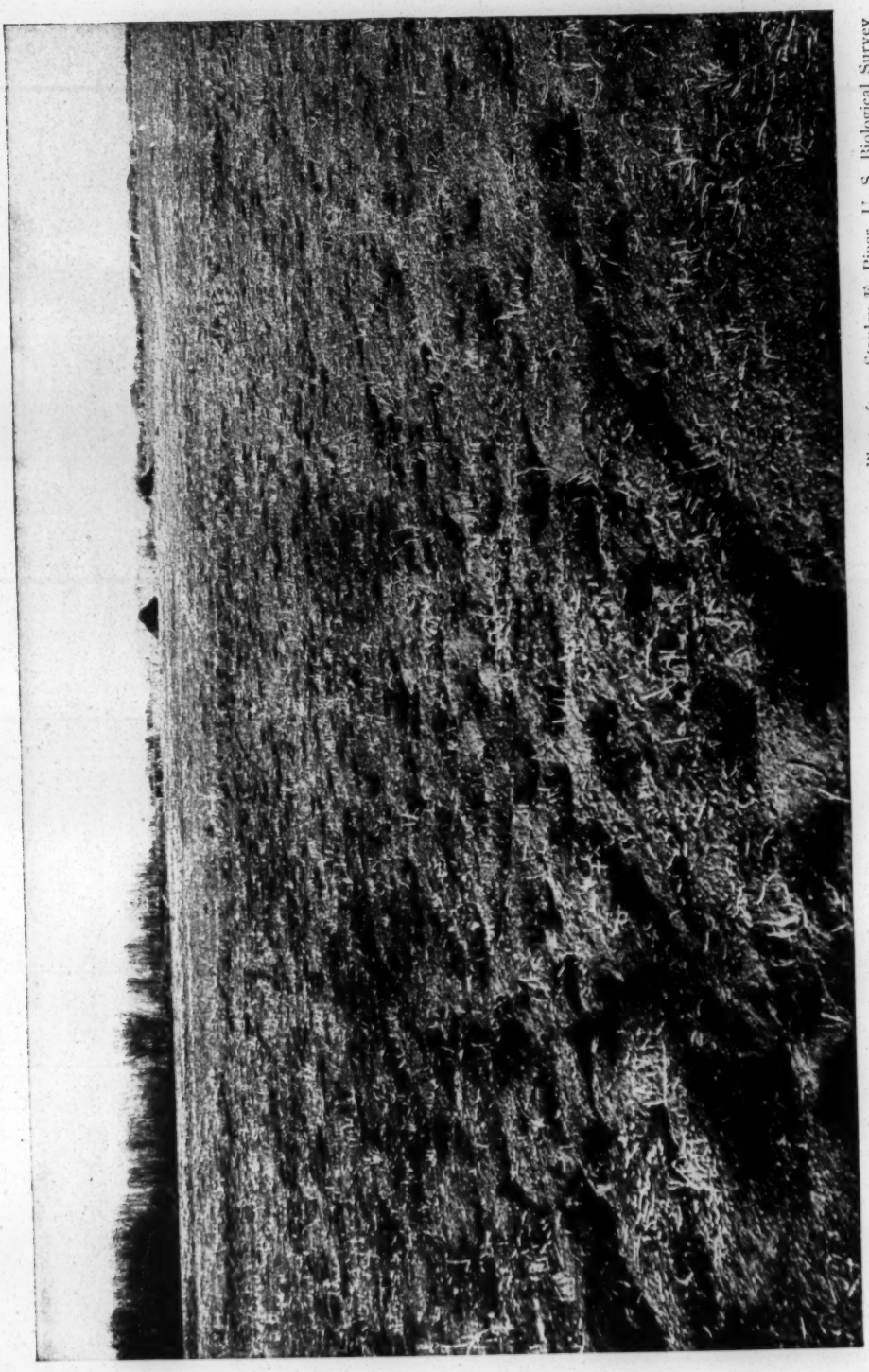


Photo from Stanley E. Piper, U. S. Biological Survey

AN ALFALFA FIELD RUINED BY MICE IN HUMBOLDT COUNTY, NEVADA

A PLAGUE OF MICE*

The work of the United States Government does not cease when irrigation projects are completed and rich farms developed by the settlers. New problems arise, to meet which not an engineer, but the trained government biologist, is required. The scourge of mice which in Nevada destroyed harvests worth hundreds of thousands of dollars would be repeated many times were it not for the genius of the experts of our U. S. Biological Survey, who have shown how destruction by such pests may be averted in the future.

DAMAGE by field mice attracted the attention of the ranchmen in the lower part of Humboldt Valley, Nevada, early in the spring of 1906, and became severe during the following summer. In the fall and winter of 1906-07 damage had increased until fields here and there in the valley were seriously injured.

By October, 1907, a large part of the cultivated lands in this district had been overrun by vast numbers of mice. The yield of hay had been reduced by one-third; potatoes and root crops were largely destroyed; many alfalfa fields were ruined by the mice eating the roots of the plants, and the complete destruction of this, the chief crop in the valley, was threatened.

The height of the plague was reached in November, when it was estimated that on many large ranches there were from 8,000 to 12,000 mice to each acre. The fields were riddled by their holes, which were scarcely a step apart, and over large areas averaged 150 to 175 to the square rod. Ditch embankments were honeycombed, and the scene was one of devastation. Serious losses in hay and root crops during the summer proved but a slight forerunner of the damage which began in the fall with the disappearance of green food. Burrowing down about the plants, and extending their underground runs from root to root, they either killed or seriously injured the alfalfa (see page 480). By November they had destroyed so large a percentage of the plants that many fields were plowed up as hopelessly ruined (see page 478). They attacked also the roots of trees, seriously injuring or quite destroying orchards. They killed most of the young shade trees planted along ditches, and so completely girdled large Lombardy and silver poplars (see page 481) that in some cases they caused the death of even such hardy trees.

The great majority of ranchmen knew neither what to expect from such great numbers of mice nor how to check them. Such plagues had usually been allowed to run their course until brought to an end by natural agencies. Hence it is not surprising that in Humboldt Valley no concerted or systematic efforts to suppress the plague in its earlier stages were undertaken, but after the mice swarmed in thousands over the fields many attempts were made to destroy them by distributing wheat poisoned with phosphorus. These, however, were spasmodic and generally proved futile, as the fields experimented on were quickly reinvaded from adjoining lands. While a few fields favorably located were saved by early poisoning, the results of such unsystematic efforts amounted to practically nothing in overcoming or even materially checking the plague.

The preparation in general use by ranchmen consisted of wheat treated with a strong solution of yellow phosphorus in carbon bisulphid, a cheap and effective poison for field mice, but inflammable, explosive, and dangerous to birds. As a result of its extensive employment in the valley, California quail, an introduced species, were decimated, and magpies, crows, meadow larks, and

* Abstracted from "The Nevada Mouse Plague of 1907-08," by Stanley E. Piper. Farmers' Bulletin 352, U. S. Department of Agriculture.

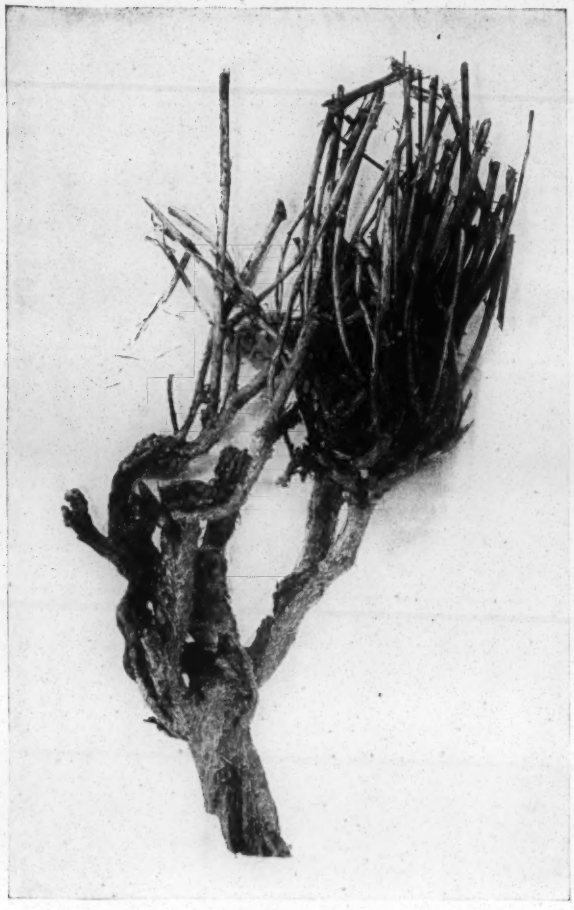


Photo from Stanley E. Piper, U. S. Biological Survey

ALFALFA PLANT KILLED BY MICE

smaller seed-eating birds suffered extremely. On one occasion 67 horned larks were found dead on about 4 acres a few hours after the poisoned grain had been distributed. Fortunately hawks, owls, gulls, and ravens were not affected, but many skunks and domestic cats were killed as the result of eating mice dying or dead of phosphorus. Several accidents occurred in handling the solution, and cases of fatal poisoning of live stock were frequent.

Several attempts by ranchmen to induce contagious diseases among the mice by means of advertised bacterial preparations failed.

ASSISTANCE OF THE U. S. BIOLOGICAL SURVEY REQUESTED

Chiefly through the coöperation of Mr George S. Webb, manager of the large Rodgers ranch, systematic experiments to destroy the pests, undertaken early in January, 1908, by the Biological Survey, demonstrated that such mouse plagues can be controlled and the greater part of the losses prevented. The experiments of the Survey proved that mice can be effectively destroyed in winter by alfalfa hay poisoned with strychnia sulphate, and this preparation was generally recommended in the valley. On the Rodgers and Anker ranches a force of 7 to 15 men was employed to distribute the poison in the fields, with most satisfactory results, and without the dangers incident to the use of phosphorus and grain.

By March 15 poisoning, supplemented by natural agencies, had destroyed the mice on several thousands of acres where they were most abundant, and the plague was broken before the remaining alfalfa fields had been overrun. In scattered centers mice continued in destructive numbers until May, but without regaining to any considerable extent by reproduction they steadily decreased. Later in the summer they had almost disappeared from the valley.

$300,000 DESTROYED BY THE MICE

The scourge of mice had swept over about four-fifths of the cultivated area in the lower part of Humboldt Valley. Of 20,000 acres in alfalfa, about 15,000 were so seriously injured as to require plowing and replanting. Over most of this area the alfalfa was replaced by grain crops for the season of 1908 at great expense and loss, since good alfalfa lands pay gross returns of from $60 to $70 per acre, while good grain crops return only $35 or $40 per acre.

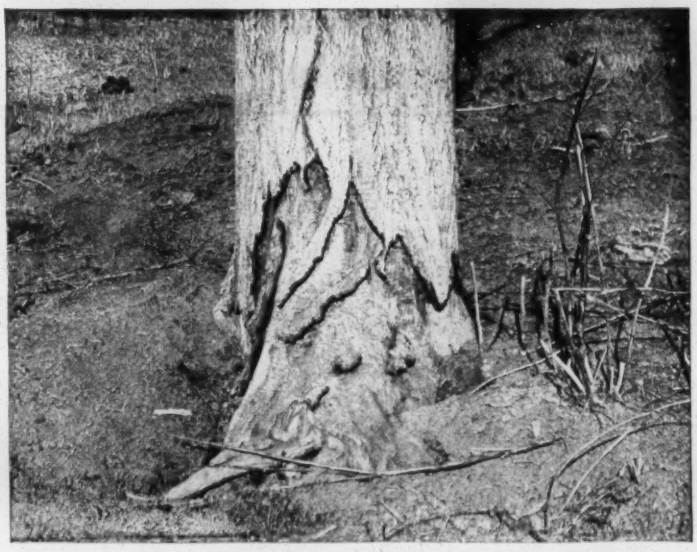


Photo from Stanley E. Piper, U. S. Biological Survey

LOMBARDY POPLAR GIRDLED AND KILLED BY FIELD MICE

The shortage of hay on the Rodgers ranch, where 2,200 acres were in alfalfa, was estimated at 2,000 tons. On Anker's ranch of 650 acres it was estimated at 600 tons. Other ranches suffered in proportion, and the loss of hay in the valley amounted to not less than $50,000. W. C. Pitt, who farms 1,400 acres of alfalfa, estimates his complete loss at $20 per acre, or $28,000. John Font estimates his damage on 1,000 acres at $20,000, and Mr Anker considers his loss on 650 acres to be $8,000. Mr Webb, on the Rodgers ranch, figures the complete loss on 2,200 acres, part of which pays considerably short of the best returns, at $30,500.

A careful consideration of the losses in hay, pasturage, root crops, and trees, the expense of restoring alfalfa fields to their former condition, and deducting the value of a grain crop for 1908 shows the average loss to be about $20 per acre. On this basis the damage to the valley amounted to $300,000.

Simultaneously with the plague in the lower part of Humboldt Valley mice appeared in enormous numbers farther up the Humboldt River and its tributaries about Winnemucca, Battle Mountain, and in Paradise and Little Humboldt valleys. As the lands infested in those districts were chiefly great natural hay meadows of red top and wild clover, the damage was less severe. However, gardens and isolated alfalfa fields were seriously injured. Later, reports of mice in alarming abundance were received from King River, Quinn River, and Carson and Smith valleys, Nevada; from Weber River Valley and from Sanpete and Utah counties, Utah, and from Honey Lake Valley, California. In none of these localities was the damage so extensive as in Humboldt Valley, though plagues of like severity were plainly threatened.

PLAGUE AVERTED IN CARSON VALLEY BY THE U. S. BIOLOGICAL SURVEY

On learning of severe damage by mice in Carson Valley, a hundred miles southwest of Lovelocks, in April, 1908, the U. S. Biological Survey sent several assistants to the valley to check the threatened plague. Carson and Humboldt valleys are alike in having large areas in alfalfa bordered by desert lands, on which field mice do not live. On a tract of about 2,500 acres near Minden mice were found to be excessively abundant, and in some fields 10 to 25 per cent of the alfalfa plants had already been destroyed. Several smaller centers were similarly affected, while over the valley generally the mice were somewhat in excess of normal numbers. This was a condition similar to that presented in Humboldt Valley during the spring of 1907, and young of all sizes were abundant. Examination of many females, a large percentage of which were pregnant, showed an average of from 6 to 7 young, while in a number as many as 10 were

USING THE BRUSH DRAG TO OBLITERATE MOUSE HOLES

In a field so badly overrun by mice as the one shown in this illustration, the drag prevents waste of labor and poison. Poison is placed in the new holes opened by the mice after the drag has passed

found. Although alfalfa was already well grown, furnishing the mice abundant food, by systematic poisoning, under the direction of the Biological Survey men, they were so effectively reduced in the infested areas as not to be dangerous again during the season—in other words, a plague was averted.

The results actually obtained here prove that mouse plagues can be checked. It takes several seasons to produce a general plague of mice, and damage is noticeable for at least a season before a serious outbreak occurs. Though natural agencies may be depended upon to overcome such abnormal numbers finally, yet, unless active repressive measures are taken, enormous damage to crops will result. Control, easy at first, becomes more and more difficult as the mice increase in numbers, and, after a plague is well established, is very expensive.

In Humboldt Valley, in the beginning, a little poisoning with green alfalfa or crushed wheat would have sufficed to prevent the plague. During the fall and winter of 1906-07, when the mice seriously injured fields here and there, they could have been destroyed with poisoned alfalfa hay. Even during the summer of 1907 concerted and vigorous poisoning would have destroyed them at a cost small indeed in comparison with the damage they inflicted later.

HAWKS, OWLS, WEASELS, AND COYOTES PROTECT THE FARMER

Of the many remarkable features of the mouse plague in Humboldt Valley, none is of greater interest, or indeed of greater significance, than the large numbers of birds and mammals which gathered to feed on the mice. Under rows of trees, about the bases of fence posts, and scattered everywhere in the fields were regurgitated pellets of mouse fur and bones, affording abundant proof of the services rendered by birds, while many holes and destroyed nests in the fields showed the work done by skunks and coyotes. So apparent was the assistance rendered by these creatures that it attracted the attention and secured the protection of the farmers, many even sparing the coyote, whose services as a mouse destroyer deserve to be more widely recognized. In Nevada coyotes were frequently seen catching mice in the daytime, and their droppings were

Photo from Stanley E. Piper, U. S. Biological Survey

THE MOUSE WHICH PRODUCED THE PLAGUE IN NEVADA (MICROTUS MONTANUS)

Photo from Stanley E. Piper, U. S. Biological Survey

MEN DISTRIBUTING POISON TO KILL THE MICE

composed entirely of mouse fur and bones.

It is deplorable that, even when their usefulness is as apparent as here, some persons continue to destroy valuable birds and mammals. During the investigations in Humboldt Valley no less than 29 large hawks were found hanging on wire fences, their useful lives ended by thoughtless gunners.

The striking evidence of the valuable services of the natural enemies of mice seen during this plague is but an example of their constant value. Hawks, owls, gulls, crows, ravens, herons, and shrikes among birds, and skunks, coyotes, foxes, weasels, badgers, and wildcats among mammals, habitually prey upon field mice, and are most valuable in preventing undue increase of these pests.

Thorough studies have shown hawks and owls to be most beneficial allies of the farmer, orchardist, and nurseryman. Most species rarely, and many of them never, attack poultry. In the Nevada valleys all species of hawks and owls are distinctly beneficial, and here rigorous protection cannot be too strongly advocated.

Among mammals the weasel and the skunk are especially worthy of protection. They are most persistent enemies of mice, and are less likely to be driven out by civilization than are other mammals. When particular individuals raid poultry houses it may be necessary to destroy them, though usually it is easy to make such houses proof against their attacks. Far from being a menace, they are generally most beneficial mammals, and, living, are worth many times the value of their pelts.

It is gratifying to note that in many localities the people are learning to appreciate these natural enemies of rodent pests, for even more important than legislation for the protection of valuable birds and animals is the recognition of their services by the farmers.

In Nevada it was noticed that hawks and owls hunted chiefly in fields near the few plantations of large trees to be found in the valleys. Beneath these trees the ground was fairly carpeted by disgorged

pellets of fur and bones, representing thousands of mice. While certain species of hawks seldom frequent trees, others habitually perch in them, notably the large rough-leg, Swainson, and red-tail, which were the most abundant and persistent mousers. In nearly all of the valleys, even those which have been farmed for years, the absence of trees is notable. More trees along ditches, about the borders of fields, and in groves here and there would doubtless increase the number of valuable resident hawks and owls and attract more winter visitors.

It was estimated that during the height of the outbreak birds and mammals destroyed some 45,000 mice daily. Although their combined assaults unaided did not suffice to abate the plague, yet when the number of mice was reduced by poison, and long before it approached the normal, they were able not only to prevent increase, but to cause a rapid decline, which continued until the mice became so scarce that the predatory birds and mammals were forced to scatter and look elsewhere for food. It is fair to infer that had these friends of the farmer been protected in the beginning they would have been able from the first to hold the mice in check, preventing the abnormal increase so that there would have been no plague.

The mouse which produced the plague in Nevada, locally known as "black mouse" (see page 483), is the Carson field mouse (*Microtus montanus*), one of the numerous species of short-tailed field mice or meadow mice, a group which has caused widespread destruction in various parts of the world. This field mouse is rather widely distributed in the valleys of Utah, Nevada, northeastern California, and eastern Oregon. In nearly all parts of the United States short-tailed field mice are among the most abundant of mammals, and a number of species in widely separated localities have occasionally exhibited the same tendency to excessive increase, indicating that favoring conditions may produce mouse plagues wherever the mice exist. Even when in small numbers they destroy considerable clover and alfalfa and injure orchards, nurseries, and root crops.

This is the first recorded instance of an irruption of field mice in North America attaining the proportions of a plague. The experience indicates the probability of future and even more disastrous outbreaks. In the extensive reclaimed areas of the West the abundant food and luxurious cover furnished by alfalfa fields and the miles of irrigation ditches, which afford these mice suitable homes along their banks, greatly favor their increase, while surrounding desert conditions limit the spread of mice beyond the cultivated areas.

THE NATIONAL GEOGRAPHIC SOCIETY AND GEOGRAPHIC WORK

THE extraordinary growth of this Society has made it incumbent on its Board of Managers to correspondingly increase its power and influence as an educative force in America. The main objects of the Society are the increase and diffusion of geographic knowledge, which must be done by three distinct methods—those of publication, of encouragement, and of research. The Board of Managers has given much attention of late to a consideration of the means best calculated to produce results in keeping with the great importance and with the high aims of the Society as a whole. Definite policies with regard to research work having been adopted during the past month, their tenor is herewith communicated to the members, together with a general review of the work of the Society.

PUBLICATION

The only regular publication of the Society is the NATIONAL GEOGRAPHIC MAGAZINE, which all members receive regularly. Every effort is made to cultivate an interest in geography by the presentation in popular and acceptable form of articles bearing on geographic subjects of general and timely importance. These articles are written by individuals thoroughly familiar with the subjects; they are illustrated fully and beautifully, while maps of value frequently supplement the text. No expense or care is omitted to make the Magazine beautiful in typography, accurate in statement, and interesting in matter.

The African number (March, 1909) may be considered as typical of our policy of uniting the various phases of science, exploration, sport, and pleasure. In our current number we present one of our frequent articles describing some line of work of the Federal Government, in this case the making of homes for millions of people on the arid desert. In our June number we shall present an article on "Ascents of Notable Peaks," with a series of illustrations of the most beautiful and most famous mountains throughout the world.

Our July number will be a special number describing the great and almost unknown Territory of Alaska: its unrivaled glaciers, superb mountains, and rapid economic development.

The Magazine will continue to give members the splendid illustrated articles of travel in and description of all parts of the world that have made the publication so indispensable in the past, and we hope to add other features, which are made possible now that the income of the Society, because of the popularity of its Magazine, has increased to such an extent that more money can be expended on the publication.

In this connection the attention of the members of the Society is invited to the fact that the first five numbers of the Magazine of this year contain 490 pages, while the same numbers in 1908 contained 386 pages.

ORIGINAL RESEARCH

The Board of Managers has long desired to prosecute, in behalf of the National Geographic Society, research work of importance and in an extended and continuing manner. From time to time the Society has extended assistance to individuals engaged in geographic work of special interest, but lack of means has naturally restricted operations to intermittent and minor occasions. At its last meeting, however, the Board of Managers set aside the sum of five thousand dollars, which is to be expended under the direction of the Committee on Research, Henry Gannett, Chairman, during the coming year, on such original research as may be thought most timely. An announcement of the work undertaken will be made in the next number of this Magazine.

In addition there was appointed a committee to raise by subscription a special fund, which shall be devoted to geographic exploration and research. It is thought that the time is ripe for such efforts, which would place America, as regards geographic work, on the same plane of generous support as now obtains in other countries. It is desired that such an amount may be raised as will make it possible for the Society to plan and carry out geographic explorations and research in an efficient, systematic, and persistent manner. The committee will present at an early day an outline of the most important geographic work to be done, accompanied by an appeal for funds for its accomplishment.

ENCOURAGEMENT TO RESEARCH

At its meeting of April 21, 1909, the Board of Managers took final and favorable action on a plan, long under consideration, for the recognition through suitable methods of geographic work of value or originality. Hereafter the Society, through its Committee on Research and Board of Managers, will regularly consider the question of awards for such specially meritorious geographic work as may be brought to its attention. The awards of medals, with or without

gratuities, will cover the whole field of geography as far as is practicable.

The adopted policy of the Society will be best understood by the publication in full of the report of a special committee, General Greely, Chairman, which was unanimously approved by the Board of Managers. The resolutions are as follows:

MEDALS OF THE NATIONAL GEOGRAPHIC SOCIETY

The medals shall be of two classes—Society medals and special medals. Society medals, being strictly representative of the National Geographic Society, shall be recognized as conferring the highest form of honor. They shall be awarded as frequently as there are works deserving them.

Society medals shall be of gold, and vary only in the superscription, which shall indicate the character of geographic service for which they have been awarded.

Special medals shall be such as may be instituted, with the approval of the National Geographic Society, from funds donated to the Society for the purpose of recognizing personal achievement in geographic fields, or to stimulate researches in the domain of geography. Special medals, or other similar awards, shall be known by the specific titles and awarded under such conditions as may be designated by the donors, the National Geographic Society acting as trustee for the proper administration of the funds and for the appropriate award of the medals.

This Society being national in its scope and in its membership, the geographic work of its members, and of other Americans similarly engaged, merit and shall receive careful consideration, especially when such work pertains to the continent of North America. Work of permanent and exceptional value shall not be ignored because of intervening time, but shall be recognized on the same basis as though of recent accomplishment.

Awards shall not be confined to exploration and discovery, but all fields of geographic research shall be properly recognized.

The Committee on Research (or other designated committee) shall from time to time recommend to the Board of Managers the issuance of medals. Such recommendations, to be in writing, shall in each case name the individual, set forth specifically the distinguished geographic service performed, specify the class of medal (whether Society or special), and formulate the inscription to be engraved thereon.

Ordinarily the award of medals shall be made at the annual dinner or other general gathering of the Society.

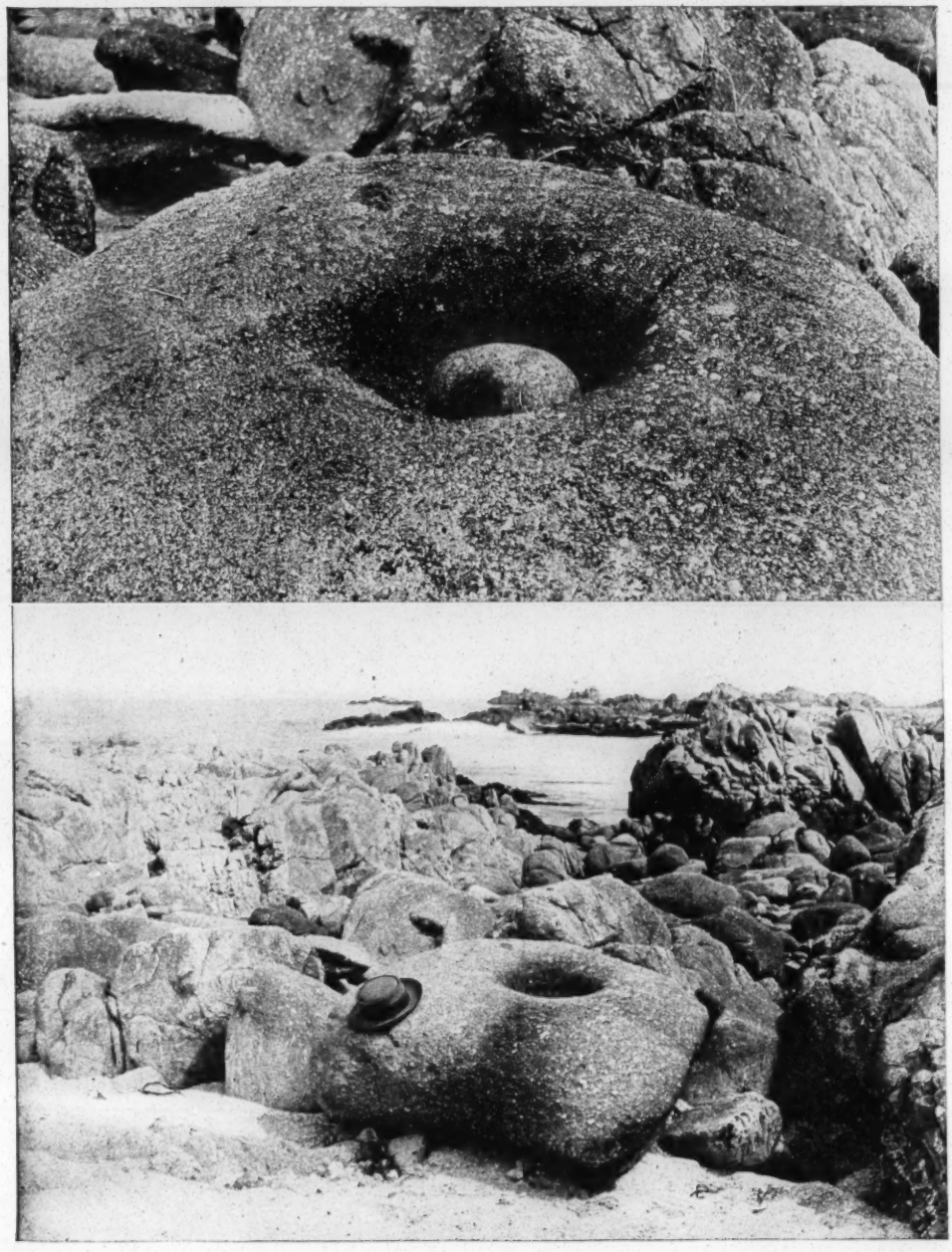
It is gratifying that this plan of encouraging geographic work by special medals for definite classes of work has already borne fruit. One of the active and generous members of the Society, Mr Grant Squires, of New York city, has made an endowment of five hundred dollars, which may be later increased in amount. The income is to be spent in awarding a special medal, with or without a gratuity in money, for such work as may increase our knowledge of the resources of the countries of the Orient and stimulate commercial relations of the United States therewith. The exact provisions of the endowment will be published with the proceedings of the Board.

It may be of interest to the members of this Society to learn that there are sixteen special medals and prizes which have been endowed by members of the Société de Geographie of Paris, which are known by names designated by the donors, and are awarded for classes of geographic work named in the endowment.

There is no reason to doubt that American generosity will similarly and speedily provide means for suitable medals and gratuities in recognition of special geographic work in which the donors may be interested. Such endowments are particularly suitable as memorials to those "on a happier voyage now toward no earthly pole," or in dedication to aspirations of the donor which time and circumstance did not permit to ripen into personal fruition.

ROOM FOR EXPANSION

The National Geographic Society has purchased for $11,000 the unimproved property on Sixteenth street adjoining Hubbard Memorial Hall. The lot fronts 28½ feet on Sixteenth street and is about 75 feet deep. If the growth of the Society continues at as rapid a rate during the next several years as during the past, additional room will be required for the business of the Society, and it was to provide for such contingencies that the ground has been acquired.



ILLUSTRATIONS OF A UNIQUE POT HOLE WORN IN A GRANITE BOULDER ON THE SHORES OF MONTEREY BAY, CALIFORNIA

The pot hole is above the level of low tide, but is submerged at middle to high tides. The first photograph gives a near view of the boulder, which has a rounded top and is about 4 × 5 × 3 feet. It also shows the pebble or "nest egg" which has eroded the crevice. The second photograph shows the size of the hole. Photos from B. X. Tucker, Richmond, California.

CUPS IN BEDROCK USED AS MORTARS FOR GRINDING ORE: INDIA

OLD MINES AND MILLS IN INDIA

EVER since England began the conquest of India old mine workings have been found in various states, and many references to them are made in the reports of the Geological Survey in India.

Several years ago a young engineer visited certain old workings in the Bombay Presidency, Southern Mahratta District, about 300 miles southeast of the city of Bombay and near Gadug. He writes: "Imagine great mines without hoisting machinery, the underground railway, or the throbbing steam pumps of today."

The workings were entered by crawling and climbing down narrow, inclined passages, over heaps of bats' dung, the accumulation of centuries; awesome with the beating of the wings of the living bats, and the rocks alive with cockroaches.

The walls of the excavations are worn smooth by the naked bodies of workers who labored under untold tyranny. The hoist and pumps were rows of humans that passed the water jars or baskets of ore from hand to hand.

These excavations reach a depth of over 200 feet (this is unusual, as the old mines are usually filled with water to within 40 or 50 feet of the surface), and are narrow, sloping tunnels that turn and twist in all directions as they follow the pay ore.

The rocks of the locality are granites, schists, and trap, but the relation of the ore to these rocks is not stated.

There is a smooth path of flagstones laid from the mines down the mountainside to the river bank, where the ore was crushed. The "mill" was described as follows:

Along the higher side of sloping bed-

ENTRANCE TO ANCIENT GOLD MINES IN INDIA

rock a trench was cut, into which water was fed and flowed into saucer-like depressions in the rock. These cups were the mortars in which the laborers ground the ore by hand, using pestles of stone.

As there were a hundred or more holes, it would seem that this "mill" was of a good capacity. This form of "mill" occurs in many places, and of them Mr. R. B. Foote, F. G. S., Superintendent of the Geological Survey of India says that "* * * the small mortars called 'Mullockers,' saucer-like hollows in the trappoid rock, are rather larger and deeper than half a cricket ball." He describes others as "* * * much larger, in which the ores were crushed by working rounded boulders, a half to one ton in weight, in them. These boulders must have been supported by some sort of frame-work."

It is believed by some persons that the mines near Gadug were worked about 2,000 years ago, and that they have been idle for at least 400 years. Of this subject Mr. Foote says: "The gold mining industry was considerable before the Mussulman invasions," and there are stories to the effect that these properties were looted of "tons of gold during the great wars"—a case where the past production is as fabulous and probably as truthful as many that are today predicted for some new properties.

GREELY'S "HANDBOOK OF ALASKA"*

THE American people, who are becoming very proud of our great northern territory, will welcome this valuable contribution by Major-General Greely to the literature of Alaska. Such a book has been long needed that would give a comprehensive, condensed, and graphic description of the enormous resources, wonderful scenery, and infinite possibilities of a region which is more than one-third greater than our Atlantic States extending from Maine to Florida combined. It is little more than one generation since Secretary Seward secured the territory for our national domain, but within this brief lapse of time Alaska has contributed to her owners three hundred and thirty-three millions of dollars of wealth in furs, gold, and fisheries. The yearly yield of products is nearly five times the price paid for "Seward's folly" in 1868, and yet the country is only on the threshold of development. General Greely's Handbook is particularly timely in view of the contemplated visit of the President to the territory this summer and of the Alaska-Yukon Exposition, which will be held during the next several months at Seattle.

No person is better equipped than the author by experience and travel to present the claims of Alaska to American recognition, for he has made six visits to Alaska, has thrice traversed the whole Yukon Valley, visiting Fairbanks and Prince William Sound twice and Nome three times. For a considerable period he exercised supreme military command over Alaska, and under his control and supervision was built the Alaskan Military Telegraph System of 4,500 miles of land lines, submarine cables, and wireless stations. The installation of these military lines for hundreds of miles through an untraversed and subarctic wilderness is one of the greatest achievements of our American soldiers.* The extent and importance of this telegraph service may be judged from the fact that the tariff on private telegrams now amounts to $250,000 annually, while Government telegrams represent at least $100,000 in tariff value.

In Chapter I General Greely shows how sharply Alaska differs in its geography from the United States. Its physical features include: Fiords of great depth of water confined by lofty precipitous cliffs and from twenty to one hundred miles in length; vast glacial fields, which are nowhere else equaled on the North American continent; volcanic ranges, with many peaks of fire and lava, stretching for one thousand miles from smoking Wrangell westward to Bogoslof, and immense frozen tundra regions, which are covered with a thick mat of vegetation, composed of mosses, lichen, shrubs, and some grass.

In Chapter III the author contradicts the general belief that the climate of Alaska is arctic in its character and in its severity. As General Greely rightly says, there is no typical Alaskan climate any more than there is a European or American climate. The extremes of latitude and longitude in Alaska find their parallel in Europe between Norway and Sicily and from western France to central Russia. It is interesting to note that the coldest month of the year at Sitka, 31.4 degrees, closely agrees with the coldest month of St. Louis, 31.6 degrees.

"The rigors of the past climate are strikingly illustrated by the great depths to which the ground is frozen. In the Nome region a shaft has been sunk 120 feet without reaching ground free from frost, and near Dawson the earth was found frozen to a depth of 200 feet."

Chapter IV describes the waterways, roads, and railroads. The river systems of Alaska afford approximately four thousand miles of navigable highways for steamers, nearly twenty-seven hundred being in the Yukon watershed. Congress, beginning with 1905, has been mak-

*Handbook of Alaska: Its resources, products, and attractions. By Major-General A. W. Greely, U. S. A. With maps and 25 full-page illustrations. New York, Charles Scribners Sons, 1909. $2.00.

*See NATIONAL GEOGRAPHIC MAGAZINE, 1904, pages 357-361, 490-494.

ing increasing appropriations for the construction of roads, appropriations to date amounting to $1,000,000. The most important road constructed follows the U. S. Signal Corps telegraph line from Valdez, which is open to shipping throughout the entire year, to Fairbanks, at the head of navigation on the Tanana River. General Greely states that practically the entire route of 385 miles "is settled, though sparsely, and road houses are situated at intervals of ten to twenty miles where most comfortable accommodations are found. Many of these enterprising proprietors have made homestead entries, are keeping stock, growing grain fodder, and raising vegetables, which are often abundant and excellent." Heavy freight can pass over the road in winter only, but in summer buckboard or light-wheeled vehicles can travel three-quarters of the distance.

The author gives an interesting description of the flagging of 500 miles of winter trails in the bleak and treeless tundra country of Seward Peninsula. Slight sticks, provided with red flannel flags, planted in the snow from fifty to one hundred yards apart, prevent the bewildered traveler from wandering from the trail and perishing in the winter blizzards.

Chapter VIII will be a revelation to those who think that the only vegetables found in Alaska are canned. "While the Seward Peninsula and the Arctic coast have no agricultural possibilities, yet considerable parts of the Yukon Basin are suitable for gardening to a degree astonishing to one uninformed. The best known instance of successful farming is that at the Holy Cross Mission on the Yukon, in 62° N. Here cattle have been raised for ten years or more and the products of the 40 acres of land under cultivation excite surprise in every visitor. At Coldfoot, within the Arctic Circle, potatoes, cabbages, turnips, rhubarb, etc., are grown of large size and good flavor. Truck gardening and hay farming are flourishing industries in the lower Tanana Valley, where it is claimed that 30,000 acres of land have been homesteaded." As the farmer gets $80 to $100 a ton for baled hay and potatoes bring from six to eight cents a pound, the successful Alaskan gardener makes more money than the miner.

In a chapter on mining the statement is made that the mineral output of the territory from 1880 to 1908 has been $148,000,000, of which $142,000,000 were in gold. Not far from 11,000 men are engaged in gold mining and prospecting. The coal deposits are extensive and of great value, covering a known area of 12,600 square miles. These coal lands were withdrawn from location by President Roosevelt in 1907 to prevent monopoly, and entries can now be made only in limited quantities. Realistic descriptions are given of the prosperous communities of Nome, Fairbanks, etc., and the assertion is made that the gold production of the Tanana Valley is far from having reached its maximum.

Equally instructive chapters describe the fisheries, the mountains, the inhabitants, the glaciers, and the game of Alaska. The salmon and cod fisheries alone have contributed harvests worth $92,000,000. Speaking of the introduction of reindeer into Alaska to prevent the extermination of the natives by starvation, General Greely says: "This action, inspired by Dr. Sheldon Jackson, promises in its results to be the most important benefit ever accorded the natives by the United States." Many of the big game are already nearly extinct. In 1907 only nineteen walrus hides were shipped out of Alaska, whereas ten years ago at least ten thousand walrus were annually killed in its waters. The game laws for Alaska, passed by Congress in 1908, it is believed, will afford some protection to game.

General Greely concludes the volume with useful tables, giving dates of historical interest, the mean temperature of various centers, the gold production by districts, the fur seal skins obtained from all waters of Alaska, the names of the glaciers, of the principal mountains and volcanoes, the value of the output of the salmon and cod fisheries, and the total products of Alaska classified from 1868 to 1908. G. H. G.

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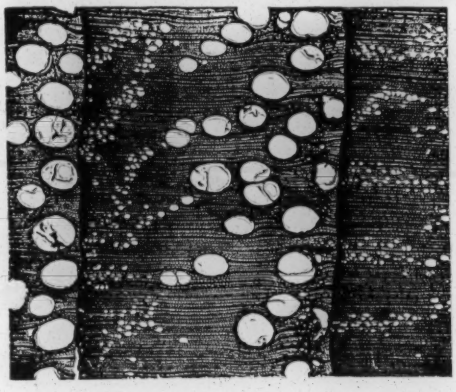

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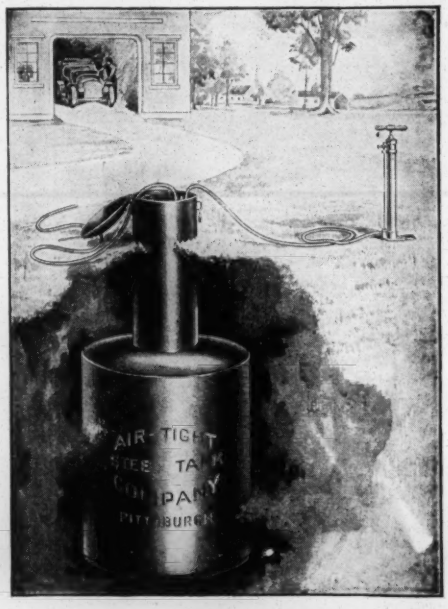

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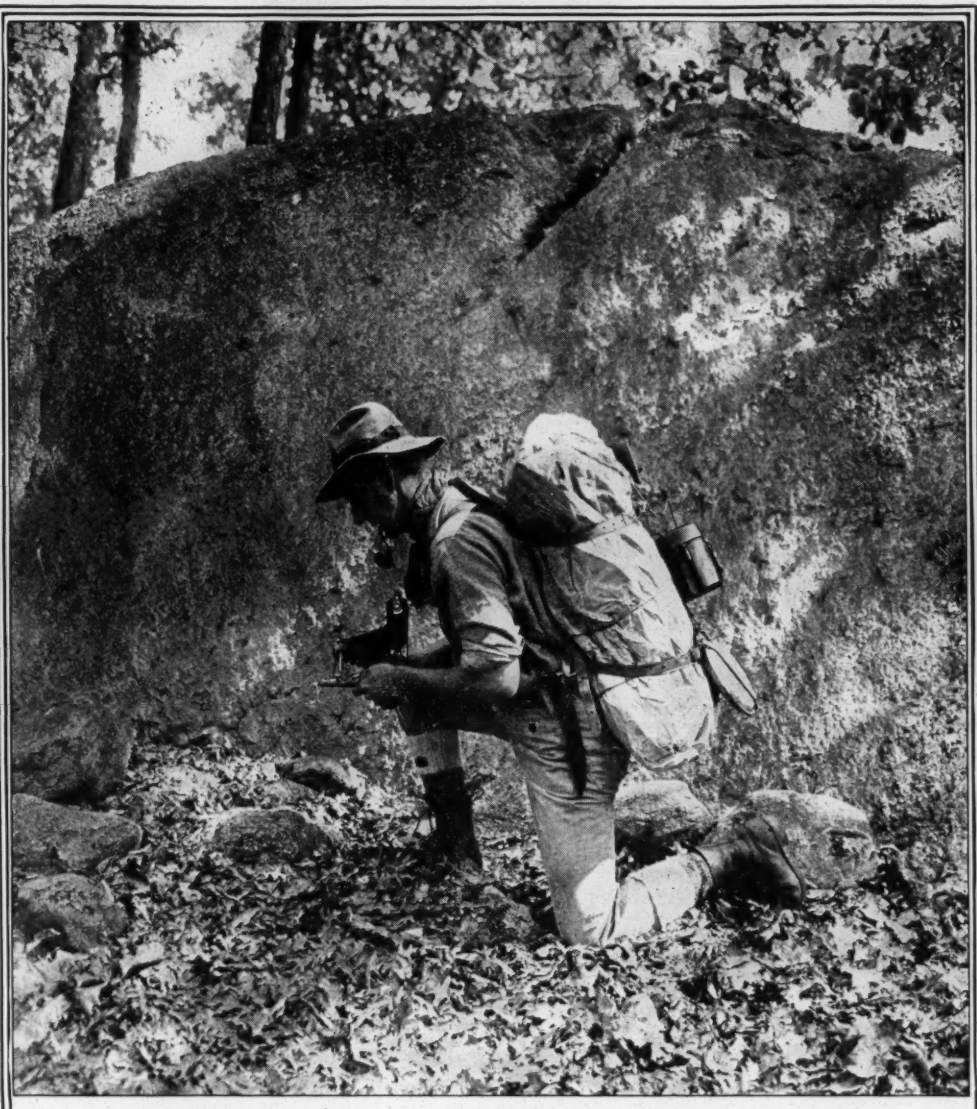

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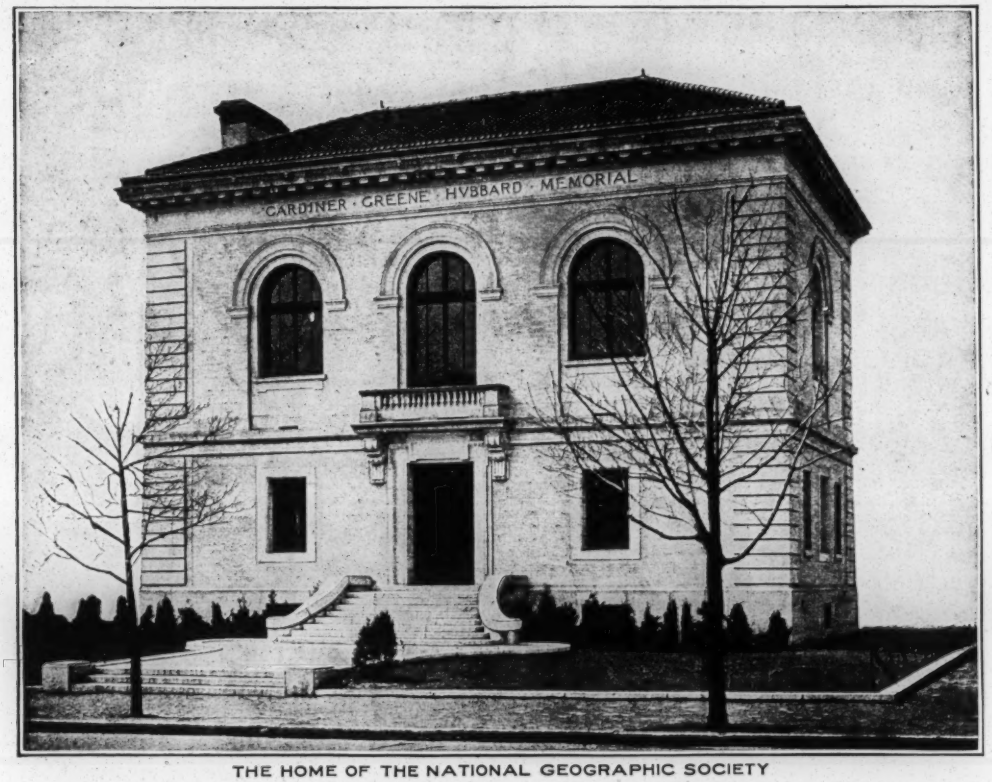

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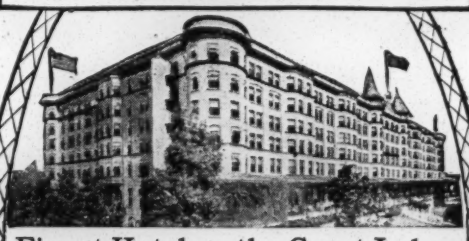

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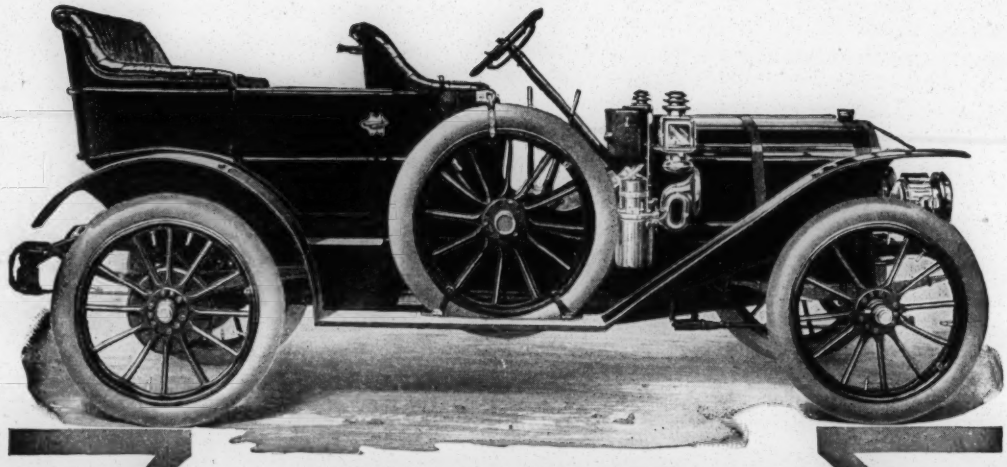

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